EKAS ASsessment

Observation

- Students report to completion
- Checking of their job
- Signing off in supervisor record are to be done.

EKAS Assessment

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

Refer Question & Marking Scheme for Tests

EKAS Components	Assessment Tasks
KS01-EG006A Single and three-phase transformers Evidence shall show an understanding of single and three phase transformers to an extent indicated by the following aspects: T1 Transformer construction encompassing: □ types of lamination style and core construction	Practical 1 to 6 Assignment Theory Test SAG Sem 2-2016-U Kyaw Naing(Joe)/ ASSESSMENT MAPPING-Sem 2-2016/ G006 Assessment Mapping/ G006.pdf

used in single-phase, three phase, double wound, auto transformers and instrument transformers. □ identification of different winding styles/types used in transformers. □ methods used to insulate low and high voltage transformers. □ construction of transformer tanks for distribution transformers. □ transformer auxiliary equipment. (Bushings, surge-diverters, tap-changers, hot oil & winding indicators, breather, Buchholz relay and conservator). □ function of transformer auxiliary equipment. □ types of information stated on transformer nameplates. □ application of transformers. □ performing basic insulation resistance, continuity and winding identification tests. T2 Transformer operation encompassing: □ principles of mutual induction of a transformer. □ factors that determine the induced voltage in a transformer winding. □ determining the value of a transformers	Youtube practical demonstration videos www.electricaldiploma2013.webs.com **Work performance + Practical Instruction Back up** Click HERE to download practicals http://www.filefactory.com/file/cf88135/n/Practical.zip Refer Electrical Machine Drive Magnetics Practicals The following Youtube Lesson Videos are supplemented to cover all aspects of EKAS Requirements. E029 Lesson 1 Electric motor drive 1 http://youtu.be/IfJVYgfBWlw E029 Lesson 2 Electric motor drive 2 http://youtu.be/ZSmWel8QZlU E029 Lesson 3 Induction motor starting http://youtu.be/9f3RB0vctNk E029 Lesson 4 Density+Friction http://youtu.be/T0W1axM9BPw

secondary voltage and current given one winding's electrical details and turns ratio. □ identification of voltage and current components of a phasor diagram for a transformer on no-load. □ principles of power transferred from the primary to secondary when a load is connected using a phasor diagram neglecting impedance drops. □ selecting transformers for specific application/s. □ safety features specified in AS/NZS3000 with respect to transformers and isolating transformers. T3 Transformer losses, efficiency and cooling encompassing: □ power losses which occur in a transformer. □ tests which allow the power losses of a transformer to be determine. □ determination of transformer losses and efficiency using test results. relationship between transformer cooling and rating. □ methods used for natural and forced cooling of transformers.	E029 Lesson 5 Linear motion http://youtu.be/9g3FiTq782Q E029 Lesson 6 Force+mass+acceleration http://youtu.be/4YotFs_Ikqo E029 Lesson 7 Acceleration against resistance http://youtu.be/9kkEdKPlXcA E029 Lesson 8 Torque+work+energy http://youtu.be/UdZBeq2BKp0 E029 Lesson 9 Momentum+Impulse http://youtu.be/WdzlLCHjgMU http://youtu.be/yWyXUZ6LooQ E029 Lesson 10 The law of machine http://youtu.be/ntKMZ04wl3E E029 Lesson 11 Stress and strain http://youtu.be/u1LyoKSxOfQ G008+G009 Lesson 1 AC Machine+AC motor control.zip http://youtu.be/fwyx6xSOPIs http://youtu.be/DJ_huMMsVT4 http://youtu.be/pezBHVInm6M G008+G009 Lesson 2 Synchronous

properties of transformer oil. tests conducted on transformer oil. T4 Transformer voltage regulation and percent impedance encompassing: voltage regulation as applicable to a transformer. reasons for voltage variation in the output of a transformer. determine the voltage regulation of a transformer from voltage and percentage impedance values. percentage impedance as applied to transformers. determine the percent impedance by using test results. determine percent impedance of a transformer by calculation. T5 Parallel operation of transformers and transformer auxiliary equipment encompassing: determine polarity markings for an unidentified single phase double wound transformer. need for parallel operation of transformers. conditions/restrictions required before two	machine+DC machine+Transformer.zip http://youtu.be/bwxocSr9ptE http://youtu.be/ohyGNBontLg http://youtu.be/adm0lWJYlyE G012 Lesson 1 Electrical components energy and power.zip http://youtu.be/erWoPZWwqKk G012 Lesson 2 Industrial electrical applications.zip http://youtu.be/fI77efWcWOI G012 Lesson 3 Transformer voltage regulation inductance capacitance.zip http://youtu.be/Lkde-u1m-7k G012 Lesson 4 Multiphase system ac dc motor.zip http://youtu.be/evclHlQ9nII G012 Lesson 5 Squirrel cage

transformers can be connected in parallel. - connecting transformers in parallel to supply a single load (loading on transformers operating in parallel). - the consequences/effect of an incorrect connection. T6 Auto-transformers and instrument transformers encompassing: - identification of auto-transformers, voltage transformers and current transformers from their winding diagrams. - determining voltage and current in the windings of an auto-transformer by calculation. - advantages and disadvantages of an auto-transformer. - AS/NZS3000 requirements with respect to transformers. - construction of voltage transformers. - ratings of voltage transformers. - construction of current transformers. - ratings of current transformers.	induction motor starting.zip http://youtu.be/1AiP0qwSczo G012 Lesson 6 Wound rotor motor motor construction starter.zip http://youtu.be/6vTtNxToGbY G040 Lesson 1 Power transformer rating 1.zip http://youtu.be/qjWJVQAh_jA G040 Lesson 1 Power transformer rating 2.zip http://youtu.be/JonzO8JD-k4 G040 Lesson 2 Open circuit short circuit test.zip http://youtu.be/Ru-KlKv40OY G040 Lesson 3 Transformer regulation.zip http://youtu.be/t6IZMwMj-B4 **DC Machine and control** G044 Lesson 1 DC Machine

▯ precautionary measures taken to connect and disconnect instrument transformers. ▯ connection diagrams for instrument transformers. ▯ applications for auto-transformers and instrument transformers. KS02-EG006A Alternating current rotating machines Evidence shall show an understanding of alternating current rotating machines to an extent indicated by the following aspects: T1 Operating Principles of three phase induction motors encompassing: ▯ determining circuit operating characteristics by using the right hand (grip) rule for conductors and solenoids and Fleming's left and right hand rules. ▯ characteristics of the magnetic field produced by a single, two and three-phase windings. ▯ speed of rotation of a rotating magnetic field. ▯ relationship between the rotor speed, slip and rotor frequency. ▯ basic principle of operation of an induction motor. ▯ reversing the direction of rotation of a three	Principle.zip http://youtu.be/-jAtAH_Ny94 G044 Lesson 2 DC Winding +Armature reaction.zip http://youtu.be/SYx2SSmMKlE http://youtu.be/YtTPpipiUYI G044 Lesson 3 Factors affecting speed & direction of rotation.zip http://youtu.be/9-7wsKVrhls http://youtu.be/O_uo2H5Rflc http://youtu.be/QaabA5pmB9E

phase induction motor T2 Three phase induction motor construction encompassing: □ basic component parts of a three-phase induction motor. □ types of rotors used in three-phase induction motors. □ connecting three-phase induction motor in both star and delta. □ dismantling three-phase induction motors. □ testing insulation resistance of a three-phase induction motor prior to connection to the supply. □ testing winding resistance (ohmic value and continuity) of a three-phase induction motor prior to connection to the supply T3 Three phase induction motor characteristics encompassing: □ relationship between torque, speed, and power and interpretation of speed/torque curves of induction motors. □ squirrel cage motors operating characteristics conditions necessary for an induction motor to produce maximum torque.	

operating characteristics of an induction motor from name plate information and by measurement. induction motors efficiency and minimum energy performance standards (MEPS). full load efficiency and power factor of induction motors. T4 Single phase motors – split phase encompassing: common types of single phase motor. principles of operation of a split phase induction motor. construction and basic characteristics of a split phase induction motor. applications of split phase induction motors. connecting, running and reversing a split phase induction motor. T5 Single phase motors – capacitor and shaded pole types encompassing: identification of single phase induction motors including capacitor start, capacitor start/capacitor run, permanent split capacitor (PSC) and shaded pole principles of operation of each motor type listed above. operating characteristics and typical applications	

of each motor type listed above. □ connection and running each type of motor listed. reversing the direction of rotation of each of the capacitor type motors. T6 Single phase motors – universal encompassing: □ principles of operation of a series universal motor. □ identification and functions of each of the basic parts of a series universal motor. □ operating characteristics and typical uses for a series universal motor. □ connecting, running and reversing a series universal motor. T7 Motor protection encompassing: □ reasons why motor protection is required. □ requirements of the AS/NZS3000 Wiring rules with regards to motor protection. □ types of motor overload protection. □ operating principles of microtherm devices, thermal and magnetic motor protection devices. □ electrical features of motor protection HRC fuses. □ effects of under voltage and over voltage on	

motors and motor circuits. □ effects of repetitive starting and/or reversing on motors. □ special requirements for motor protection, in high humidity or moist environments, high temperature areas and corrosive atmospheres. □ operating principles of phase failure protection. □ selecting suitable protective devices for a given motor and starter combination. T8 Three phase synchronous machines- operation principles and construction encompassing: □ power transfer diagram of an a.c. synchronous machine. □ need for the generation of a sinusoidal waveform. □ principles of operation of a synchronous alternator. □ principles of operation of a synchronous motor. □ principles of operation of an asynchronous generator (induction generator). □ identification of main parts of a synchronous alternator/motor. □ methods used to provide the excitation of a synchronous alternator/motor.	

block diagram of an alternator voltage regulator. advantages gained by the parallel operation of alternators. starting methods of synchronous motors. T9 Alternators and generators encompassing: effects on the generated voltage of variations in excitation. effects on generated voltage of variations in load. identification of characteristic curves of an alternator. types of prime movers used with single and three phase portable/standby alternators. manual operation of single and three phase portable/standby alternators. ratings of single and three phase portable/standby alternators. applications of single and three phase portable/standby alternators. construction details of single and three phase portable/standby alternators. common faults found in portable/standby alternators.	

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1	X		
1.2	X		
1.3	X		
1.4		X	X
1.5		X	X
1.6	X		
1.7	X		
2.1	X		
2.2	X		
2.3	X		
2.4		X	X
2.5		X	X
2.6	X		
2.7		X	X
3.1	X		
3.2	X		
3.3		X	X
3.4		X	X
EKAS Assessment		X	X

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment		Theory Test Assessment SAG Sem 2-2016-U Kyaw Naing(Joe)/ ASSESSMENT MAPPING-Sem 2-2016/ G006 Assessment Mapping/

Cover/ Feedback own record		G006.pdf In 2005 G006 is delivered & assessed concurrently with G033+G063 **ASSESSMENT QUESTIONS IN THE TESTS ARE BASED ON THE QUESTIONS ATTACHED WITH THIS ASSESSMENT MAPPING, BUT IN ACTUAL ASSESSMENT,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME** Record2015/Students/TAFE/2015 Sem 2/Sem 2 Assessment 1 Wk 9 -- G033+G063 Assessment Cover Sheet+ Assessment Feedback Sheets
Students' work in own record	Summative Assessment- Formal Tests	Record2015/Students/TAFE/Sem 2-2015/Sem 2 Assessment 1 Wk 9 Record2015/Students/TAFE/Sem 2-2015/Test 25 Nov 2015/ Record2015/Students/TAFE/Sem 2-2015/Test 26 Nov 2015/ Record2015/Students/TAFE/Sem 2-2015/Test 23 Nov 2015/ In 2005 G006 is delivered & assessed concurrently with G033+G063
	Formative Assessment/Practical+ Class works	Record2015/Students/TAFE/2015 Sem 2/G033 Practical Sem 2 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 2 Nov 2015

		Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 9 Nov 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 12 Oct 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 19 Oct 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 20 Oct 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 22 Oct 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 26 Oct 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 27 Oct 2015 Record2015/Students/TAFE/2015 Sem 2/K2.11 Practical 29 Oct 2015 K2.11 Practical Class 28 July 2015 K2.11 Practical 13 Oct 2015 In 2005 G006 is delivered & assessed concurrently with G033+G063
Marking Guide to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents
Students' work		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5

to be presented for audit	Printed documents

ELECTRICAL MACHINES ONLINE REFERENCES

G003+G004+G009Practicals.pdf (12.48MB)
http://www.filefactory.com/file/1ervyinu9f9p/n/G003+G004+G009Practicals.pdf

Generator Test.pdf (0.61MB)
http://www.filefactory.com/file/1ro58odzv66b/n/Generator_Test.pdf

MachineRepair3.zip (3.61MB)
http://www.filefactory.com/file/26197nmhm9xp/n/MachineRepair3.zip

G044+7762AC2.zip (5.45MB)
http://www.filefactory.com/file/2i0lvwmkuuo1/n/G044+7762AC2.zip

E029 Motor Control 1.zip (13.32MB)
http://www.filefactory.com/file/2quq5jmokorv/n/E029_Motor_Control_1.zip

MachineControlCkt2.zip (7.64MB)
http://www.filefactory.com/file/351e0jbndf6v/n/MachineControlCkt2.zip

8PowerElectronicsDevices.zip (5.6MB)
http://www.filefactory.com/file/3qlpzhajv63z/n/8PowerElectronicsDevices.zip

MachineRepair1.zip (6.25MB)
http://www.filefactory.com/file/49rtbxh0lat1/n/MachineRepair1.zip

G044+7762AC1.zip (5.86MB)
http://www.filefactory.com/file/4ui61pg2c08j/n/G044+7762AC1.zip

Power Transformer+Line-G040.zip (158.78MB)
http://www.filefactory.com/file/544vu4ngj3pr/n/Power_Transformer+Line-G040.zip

Elect Machine-G043+G044+G045.zip (118.53MB)
http://www.filefactory.com/file/59l01bsiz7jh/n/Elect_Machine-G043+G044+G045.zip

MachineControlCkt1.zip (9.7MB)
http://www.filefactory.com/file/5l2uobw1vkgd/n/MachineControlCkt1.zip

MachineControlCkt3.zip (16.13MB)
http://www.filefactory.com/file/67jxjmpmnurd/n/MachineControlCkt3.zip

MachineRepair2.zip (4.64MB)
http://www.filefactory.com/file/709idhg8abzr/n/MachineRepair2.zip

7MachineDriveSystems.zip (8.36MB)
http://www.filefactory.com/file/c2musrlclul/n/7MachineDriveSystems.zip

G040_7762AD_Notes.doc (9.24MB)
http://www.filefactory.com/file/ga7n81yn8zv/n/G040_7762AD_Notes.doc

E029 Motor Control 2.zip (14.8MB)
http://www.filefactory.com/file/t5nysdqpby3/n/E029_Motor_Control_2.zip

G044 Tutorial.doc (4.05MB)
http://www.filefactory.com/file/uc45qc6va87/n/G044_Tutorial.doc

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with G143A Assessment Mapping+Performance+Marking Guide.pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	UEEEL0041 - Develop engineering solution for synchronous machine and control problems		

Copy and paste the following table for each element as required

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1.Prepare to developengineering solution for synchronous machine problems	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures	Q1+2 of G143A Assessment Mapping+Performance+ Marking Guide.pdf Page 1		
	1.2	Established OHS risk control measures and procedures	Q3+4of G143A Assessment Mapping+Performance+ Marking Guide..pdf Page 2		
	1.3	The extent of the machine problem is obtained from documentation and from work supervisor to establish the scope of work to be undertaken.		Practical- Generator Test	
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.		Observation in Practical	
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.			Advanced Diploma in Electrical Engineering Exercises Page 208) Q 11, 12
2. Develop engineering solution for synchronous machine problems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.	As per 1.1,1.2,1.3		
	2.2	Knowledge of synchronous machine construction, operation, characteristics and applications are applied to developing	Q1 to 6 of G143A Assessment Mapping+Performance+		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
		solutions to synchronous machine problems.	Marking Guide.pdf Page 5,6		
	2.3	Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures	As above		
	2.4	Approaches to resolving synchronous machine problems are analysed to provide most effective solutions.	As above		
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.	As above		
3 Test, document and implement engineering solution for synchronous machine problem.	3.1	Solutions to machine problems are tested to determine their effectiveness and modified where necessary.	Q 1 to 6 of Test 3		
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed	Q 1 to 6 of Test 3		
	3.3	Appropriately competent and qualified person(s) required to implement solutions to synchronous machine problems are coordinated in accordance with regulatory requirements and enterprise policy	Q 1 to 6 of Test 3		
	3.4	Justification for solutions used to solve synchronous machine problems is documented for inclusion in work/project development records in accordance with professional	Q 1 to 6 of Test 3		

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Testing generator		Practical	
Measuring Synchronous impedance		Practical	

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Investigating the relation between frequency and voltage generated.		Practical	

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 a.c. generators – construction, types and cooling	Advanced Diploma in Electrical Engineering Exercises Page 131) Q 64 to 67		
T2 a.c. generators – operating principles and characteristics	Advanced Diploma in Electrical Engineering Exercises Page 131) Q 68 to 70		
T3 Synchronising a.c. generators			Advanced Diploma in Electrical Engineering Exercises Page 131) Q 79 to 87

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T4 a.c. generators power, torque and efficiency	Advanced Diploma in Electrical Engineering Exercises Page 131) Q 70		
T5 Voltage regulation (AVR)			Advanced Diploma in Electrical Engineering Exercises Page 131) Q 77 to 84
T6 a.c. generator operational stability			Advanced Diploma in Electrical Engineering Exercises Page 131) Q 82 to 85
T7 a.c. generator protection			Advanced Diploma in Electrical Engineering Exercises Page 128) Q 57 , 58
T8 Induction generator			Advanced Diploma in Electrical Engineering Exercises Page 166) Q 64

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T9 Three phase synchronous motors			Advanced Diploma in Electrical Engineering Exercises Page 167) Q 72 to 76

Add rows to the following table as required

Assessment Conditions	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments Records relating to electrical engineering resources	Test 1, 2, 3	Practical	All assignments

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UEENEEG143A Develop engineering solution for synchronous machine

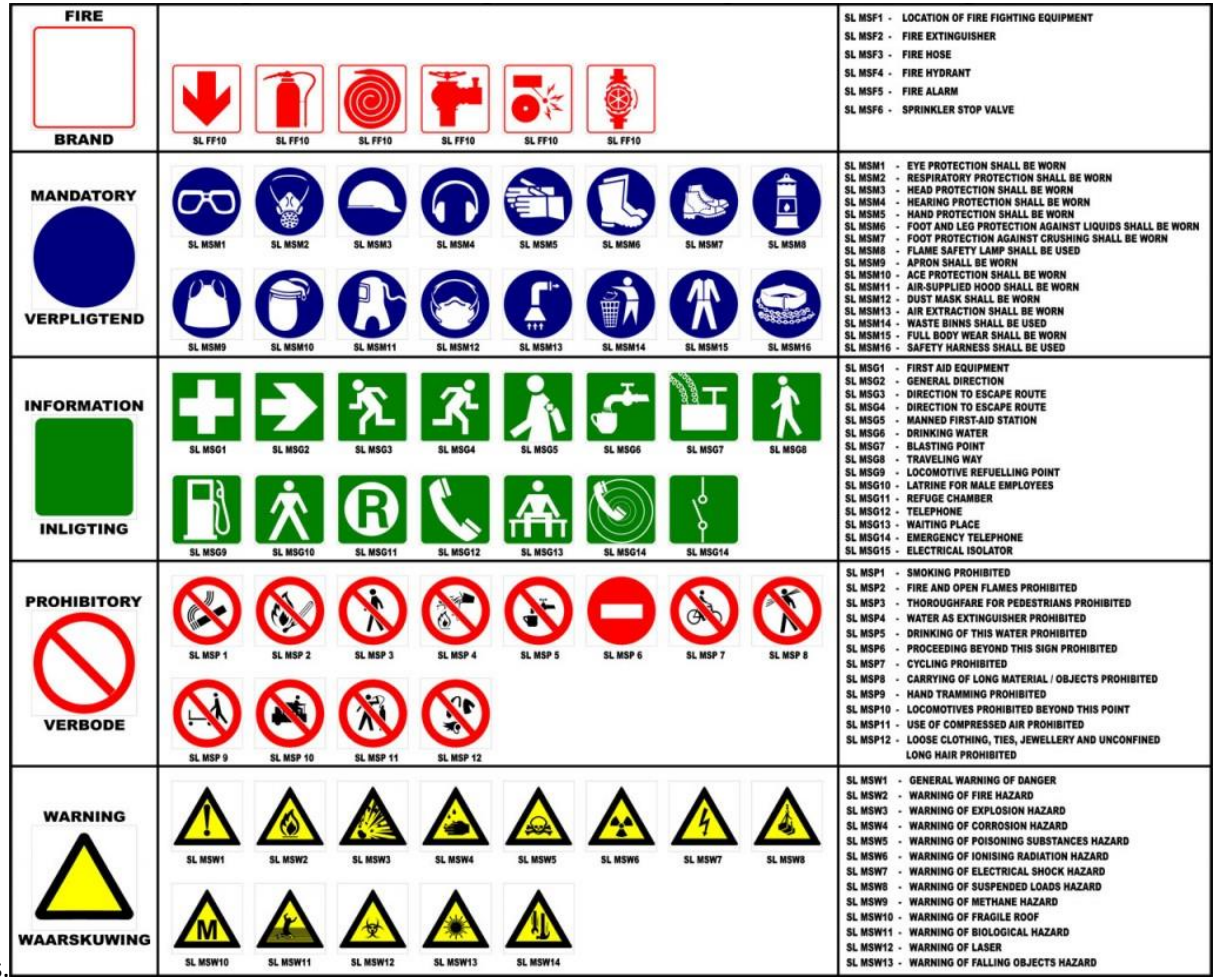
UNIT CAPSTONE ASSESSMENT

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

1 1 Prepare to developengineering solution for synchronous machine problems

1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.

Q1. Identify safety equipments & signs to be used when you are using fitting & machining process.



Answers +Marking Guide (2 marks)

Safety glass

Safety glove

Safety shoe

Ear protection

First aids sign

Q2 Write the safety procedure to operate the drilling machine

Answers +Marking Guide (5 marks)

PRE-OPERATIONAL SAFETY CHECKS

1. **Check workspace and walkways to ensure no slip-hazards are present.**
2. **Check that the drill chuck guard is in position.**
3. **Ensure the chuck key (if used) has been removed from the drill chuck.**
4. **Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).**
5. **Follow correct clamping procedures to ensure work is secure.**
6. **If the job obstructs the walkway erect a barricade.**
7. **Adjust spindle speed to suit drill or cutter diameter.**
8. **Faulty equipment must not be used. Immediately report suspect equipment.**

OPERATIONAL SAFETY CHECKS

1. **Never leave the Drill Press while it is running.**
2. **Before making adjustments or before cleaning swarf accumulations switch off and bring the machine to a complete standstill.**
3. **Feed downwards at a sufficient rate to keep the drill cutting.**
4. **Feed with care as the drill breaks through the underside of the work.**
5. **Use a safe working posture (beware of hair catching).**

HOUSEKEEPING

1. **Switch off the machine.**
2. **Leave the machine in a safe, clean and tidy state.**

POTENTIAL HAZARDS

- **Hair/clothing entanglement - rotating spindle/drill**
- **Eye injuries**
- **Flying swarf/chips**
- **Sharp edges & burrs**

1.2 Established OHS risk control measures and procedures

Q3 What are the main source of hazards to use the drilling machine?

Answers +Marking Guide (5 marks)

(1)Hazards related to the machinery or plant, materials or items being processed or internal sources of energy, for example:
- drawing in or trapping hazards;
- entanglement hazards;

- shearing hazards;
- cutting hazards;
- impact hazards;

(2)hazards related to the location of the machine or plant, for example:
- its stability, for instance, whether it could roll or fall over;

(3)hazards related to systems of work associated with the machine or plant, for example manual handling injuries caused when putting materials into them.

To prevent the hazards, the above risks are to be identified & eliminated.

Q4.Write WHS Duty of Care Checklist for Managers/Supervisors

Answers +Marking Guide (8 marks)

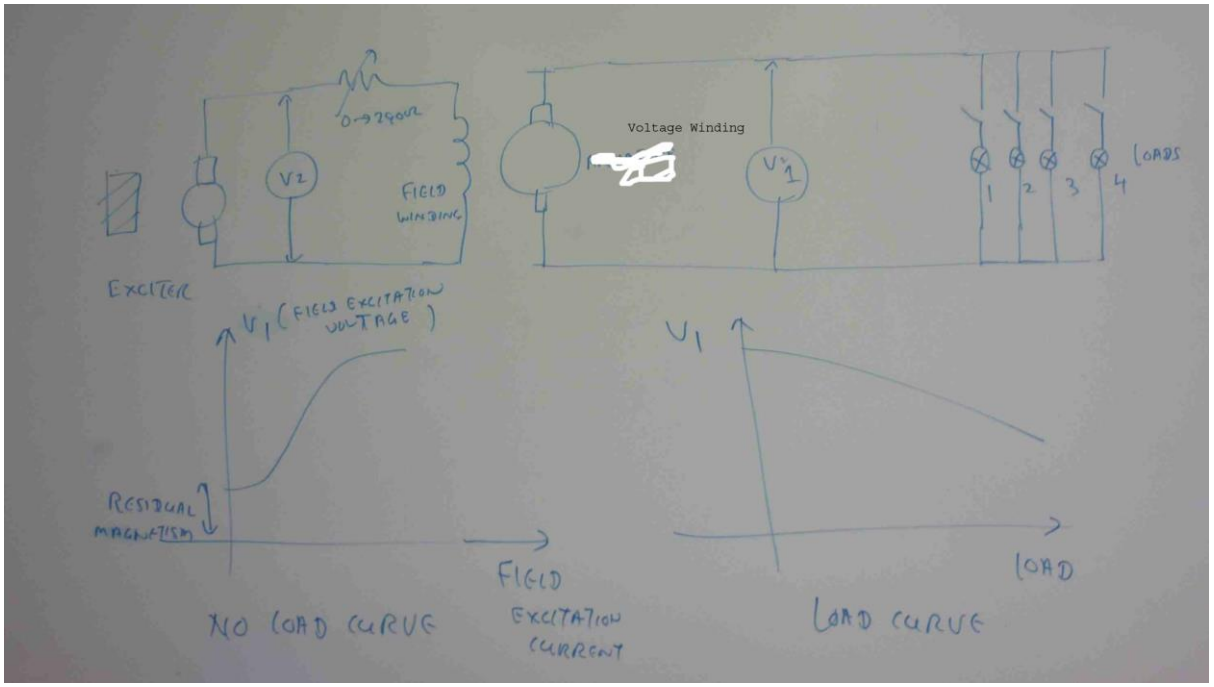
WHS Duty of Care Checklist for Managers/Supervisors

- Familiarise yourself with the organization Work Health & Safety Policy 2016 and Work Health and Safety Procedures to ensure you are aware of your personal responsibility for workplace health and safety (WHS) within your area of delegated authority.
- Ensure that the work for which you are responsible is carried out in accordance with the University's WHS risk management steps to safeguard the health, safety and wellbeing of those involved and others who may be affected.
- Demonstrate active and visible leadership in WHS risk management. Identify hazards or WHS risks associated with different jobs, tasks and projects and assess the risks to the health and safety of those involved. Conduct this risk identification and assessment in consultation with those involved or affected.
- Implement suitable risk controls within agreed timeframes. These may include competency based training, adequate supervision and adoption of safe operating procedures. Choose these risk controls in consultation with those involved or affected.
- Inform staff, students and contractors of WHS requirements and expectations, directing them to relevant information and risk control resources available. This may include local WHS induction (refer to the WHS induction checklist), on-the-job instruction and specific WHS training.
- Promptly address WHS issues that are brought to your attention in consultation with those involved or affected.
- Refer WHS issues that are beyond your control to the relevant manager(s) for their attention, but ensure that interim action is taken to reduce the risks in a practical way.
- Investigate incidents, seeking to identify the causes and take steps to prevent recurrence.

1.3 The extent of the machine problem is obtained from documentation and from work supervisor to establish the scope of work to be undertaken.

The performance characteristics of AC Generator is to be assessed by performing the following practical tasks.

Practical 1-Generator Load Test



In the above circuit, AC Generator is also coupled to motor drive system & its Synchronous characteristics is to be determined.

Students performance in the practical is assessed.

1.4 Activities are planned to meet scheduled timelines in consultation with others involved in

the work.

Students cooperation & performance in the practical is assessed.

1.5 Effective strategies are formed to ensure solution development and implementation is carried out

1.5Effective strategies are formed to ensure solution development and implementation is carried out efficiently.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 208)

(3) Strategy objective

Slide 1+2
Q11.What are the developing of strategies in project?
Q12.How will you examine the effectiveness of activities in project management?

Students co-operation in the practical is evaluated.

2 Develop engineering solution for synchronous machine problems.	
2.1	Established OHS risk control measures and procedures for carrying out the work are followed.

As per 1.1, 1.2 & 1.3

2.2 Knowledge of synchronous machine construction, operation, characteristics and applications are applied to developing solutions to synchronous machine problems.

2.3 Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures.

2.4 Approaches to resolving synchronous machine problems are analysed to provide most effective solutions.

2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.

2.6 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

ASSESSMENT

The students' performance in the following questions are to be assessed.

1. A 400 hp (300KW) , 6600V 60HZ 200 rpm synchronous motor operates at full load at a leading power factor of 0.8. If the synchronous reactance is 11 ohm Calculate the followings

   (a) The apparent power of the motor per phase
   (b) The ac line current
   (c) The value and phase of Ef
   (d)Determine the torque angle δ (4 marks)

2. The factory has the following loads.

   (i)Two 50 HP 3 phase induction motors PF 0.707 lagging efficiency 90%
   (ii)Three 40 KW 3 phase induction motor power factor 0.8 lagging efficiency 95%
   (iii)If 1 60 KW 3 phase synchronous motor with efficiency 98% 0.6 pf leading is connected in parallel

   Calculate total active and reactive power absorbed from the supply and total power factor.

   (4 marks)

3. Sketch the connection diagram of synchronous induction motor.

   (2 marks)

4. Describe (i) Auxiliary motor starting (ii) Induction motor starting of a synchronous motor.

   (2 marks)

5 .What is significant difference between synchronous motor and induction motor?

   (2 marks)

6. A synchronous capacitor is rated at 160 MVAR 16 KV 1200 rpm 60 HZ. It has a synchronous reactance of 0.8 pu and is connected to a 16 KV line.

   Calculate the value of Ef so that the machine

   (a) absorb 160 MVAR (b) deliver 120 MVAR

3 Test, document and implement engineering solution for synchronous machine problem.

3.1 Solutions to machine problems are tested to determine their effectiveness and modified

where necessary.

3.2 Adopted solutions are documented including instruction for their implementation that

incorporates risk control measure to be followed.

3.3 Appropriately competent and qualified person(s) required to implement solutions to synchronous machine problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)

3.4 Justification for solutions used to solve synchronous machine problems is documented for inclusion in work/project development records in accordance with professional

EKAS Assessment

SAG Sem 2-2016 –U Kyaw Naing (Joe)/ASSESSMENT Mapping –Sem 2-2016/G143+145 Assessment Mapping/G143+145 Tests—Test 3 Q1,Q2,Q3,Q4,Q5,Q6

DELIVERY TO ACHIEVE THE COMPETENCY

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

www.electricaldiploma2013.webs.com

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

Elect Machine-G043+G044+G045.zip

Electrical Machines

AC Machines 1

AC Machines 2

The students will have to answers the following questions

Slide 1+2+3

Q64.Explain the major difference between induction machine and synchronous machine.

Slide 3+4+5+6

Q65.Explain the construction of synchronous machine

---

(12) Synchronous generator

Slide 1

Q66.Sketch the equivalent circuit , vector diagram and write the voltage equation for synchronous

generator.

Slide 2

Q67.Sketch the circuit, vector diagram and write the voltage equation for synchronous motor.

---

(13) Effect of field excitation

Slide 1+2

Q68.Explain the effect of field excitation on power factor of synchronous motor.

Slide 3+4+5

Q69.A three phase star connected alternator has a resistance of 0.3Ω and a synchronous reactance of 7 Ω per phase. It is excited to give 6.6KV line voltage on open circuit. Determine the internal voltage and per unit voltage regulation on full load current of 150 amp when the load power factor is (a) 0.707 lagging (b) 0.8 leading.

Slide 6+7

Q70.A 4000 Kw 6.6 KV 50 HZ 250 rpm synchronous motor operates at full load 0.7 leading power factor if the synchronous reactance is 15Ω. Calculate the followings

(a) The apparent power of the motor per phase

(b) The AC line current

(c) The value and phase of Ef

(d) (d) Determine the torque angle δ

Slide 8+9+10

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Q71.A synchronous condenser is rated at 260MVAR 26 KV 1500 rpm, 60HZ. It has a synchronous reactance of 0.8 pu and is connected to 26KV line. Calculate the value of Ef so that the machine (a) absorb 200MVAR (b) deliver 150 MVAR

---

(14) Oscillation of synchronous machines

Slide 1+2

Q72.A 3000KV three phase 4 poles star connected synchronous machine has resistance and synchronous reactance per phase of 0.3Ω and 2Ω respectively. Calculate the emf and rotor displacement when the machine acts as a motor with input of 700MW and pf 0.9 lagging.

If the field current is required to produce emf / ph equal to rated voltage. Determine also field current for field excitation.

Slide 3+4+5+6

Q73.The factory has the following loads.

(a) 3 x 50HP three phase induction motor PF 0.6 lagging , efficiency 85%

(b) 4 x 45 Kw three phase induction motor 0.85 pf lagging, efficiency 90%

Calculate total active and reactive power. If one 100KW three phase synchronous motor with 97% efficiency, 0.65 leading pf is connected in parallel, calculate total active and reactive power and power factor.

Slide 6+7+8

Q74.Explain starting methods for synchronous motor.

Slide 9+10

Q75.Compare synchronous motor & induction motor

Slide 11+12 (Single phase motor)

Q76.Explain (a) cross field theory (b) rotating field theory of single phase motor.

---

(15) Generator control

Slide 1+2

Q77.Explain the control of electric generating system.

Slide 3+4

Q78.Explain voltage regulator.

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Slide 5+6+7

Q79.Explain prime mover & governor

Slide 8+9

Q80.Explain the types of excitations

Slide 10+11

Q81.How will you select the regulator to control generator voltage?

Slide 12+13

Q82.What are the factors affecting voltage stability of generator system?

Slide 14+15

Q83. Sketch remote voltage sensing system

Slide 16

Q84.Explain typical generator instability problem.

Slide 17+18+22+23

Q85.Explain digital excitation system.

Slide 19+20+21

Q86.Sketch generator parallel control system.

Slide 24

Q87.Explain digital voltage regulation system.

Refer Question & Marking Scheme for Tests

EKAS Components	Assessment Tasks
KS01-EG143A Synchronous machine diagnostics Evidence shall show an understanding of developing engineering solutions for synchronous machine problems to an extent indicated by the following aspects: T1 a.c. generators – construction, types and cooling encompassing: □ construction of stator and rotor windings □ rotor construction (cylindrical and salient pole) □ advantages of rotating field construction □ excitation methods □ cooling methods	SAG Sem 2-2016 –U Kyaw Naing (Joe)/ASSESSMENT Mapping –Sem 2-2016/G143+145 Assessment Mapping/G143+145 Tests www.electricaldiploma2013.webs.com **Youtube Videos for Electrical Engineering Lessons** G043+G045+ G143+145+I145 Page 308 to 329 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf **Induction and synchronous machines & control** G043+G045 Lesson 1 AC Machine Introduction.zip http://youtu.be/-WlfOPhNDn8 G043+G045 Lesson 2 Slip+Equivalent Ckt.zip

▯ prime movers T2 a.c. generators – operating principles and characteristics encompassing: ▯ a.c. generator equivalent circuits (synchronous reactance and resistance components) ▯ tests – open circuit, short circuit, stator impedance ▯ voltage regulation, island generator's terminal voltage load power factor ▯ determination of excitation voltage and load angle T3 Synchronising a.c. generators encompassing: ▯ conditions for synchronising (infinite bus) ▯ methods for synchronising (lamp methods, synchroscope) ▯ alternator load sharing, parallel operation T4 a.c. generators power, torque and efficiency encompassing: ▯ power input, input torque, speed ▯ power losses ▯ output power, load power factor, rotor angle, pu power	http://youtu.be/De79cbk2EOQ http://youtu.be/gprZTitiOao G043+G045 Lesson 3 Power Transfer.zip http://youtu.be/pCMcMPBrUEE http://youtu.be/7tJjDuG5SQc http://youtu.be/dV9VFsXeFnY G043+G045 Lesson 4 Test for equivalent ckt.zip http://youtu.be/HF4bJ6vWX2c G043+G045 Lesson 5 Equivalent Ckt Problems.zip http://youtu.be/PyPQsw0L_o0 http://youtu.be/f8VbD_APNfk http://youtu.be/SROLC5hkoc0 G043+G045 Lesson 6 Motor starting and control.zip http://youtu.be/Utfbzs7Ti6M http://youtu.be/VnNlesPgeZk http://youtu.be/AMO70oGS2Fs http://youtu.be/FQVMCMDSTwo G043+G045 Lesson 7 Synchronous machine introduction.zip

⍰ efficiency ⍰ performance chart interpretation T5 Voltage regulation (AVR) encompassing: ⍰ need for AVR's ⍰ features of AVR's ⍰ effects of rotor inductance ⍰ connections of AVRs ⍰ operation of AVRs T6 a.c. generator operational stability encompassing: ⍰ power output, VAR effects, rotor angle, excitation ⍰ control of VAR (OLTC transformers) ⍰ voltage dependant nature of stability ⍰ critical clearance angle of a.c. generator ⍰ stability limits T7 a.c. generator protection encompassing: ⍰ restricted, unrestricted primary, back up and duplicated protection ⍰ overcurrent, short circuit, differential, reverse power, load unbalance, rotor overload, loss-of-field, rotor earth fault, station	http://youtu.be/KM9TJcr2MBk G043+G045 Lesson 8 Synchronous machine ckt problems.zip http://youtu.be/ZGsmZfLiPoc http://youtu.be/bnpYxKtSz1c G043+G045 Lesson 9 Synchronous machine starting.zip http://youtu.be/p4x03LkgBc8 http://youtu.be/yKmNWaxT2Hk G043+G045 Lesson 10 Single phase motor.zip http://youtu.be/9OgmEb0tFpE G043+G045 Lesson 11 Factors affecting motor operation.zip http://youtu.be/sAqyhDlpwwY

earth fault, under frequency protection ▯ external fault protection T8 Induction generator encompassing: ▯ types operating principles, characteristics ▯ excitation methods ▯ losses and efficiency ▯ synchronising and paralleling T9 Three phase synchronous motors encompassing: ▯ construction – rotor, stator, windings ▯ excitation methods ▯ operating principles (equivalent circuits, synchronous impedance) ▯ hunting and stability limits ▯ power factor correction ▯ paralleling and synchronisation techniques ▯ starting methods ▯ braking methods	

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1	X		
1.2	X		
1.3	X	X	
1.4		X	X
1.5		X	X
2.1	X		
2.2		X	X
2.3		X	X
2.4		X	X
2.5		X	X
2.6		X	X
2.7		X	X
3.1		X	X
3.2		X	X
3.3		X	X
3.4		X	X
EKAS Assessment		X	X

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Theory Test Assessment SAG Sem 2-2016 –U Kyaw Naing (Joe)/ASSESSMENT Mapping –Sem 2-2016/G143+145 Assessment Mapping/G143+145 Tests G143 & G145 are assessed concurrently.

		ASSESSMENT QUESTIONS IN THE TESTS ARE BASED ON THE QUESTIONS ATTACHED WITH THIS ASSESSMENT MAPPING, BUT IN ACTUAL ASSESSMENT,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME
Students' work in own record	Summative Assessment- Formal Tests	Record 2016/Students/TAFE/Sem 1 2016/Sem 1 2016 Students work assessment 2/G143 Assessment 2
	Formative Assessment/Practical+ Class works	Presented students' practical work report Record 2016/Students/TAFE/2015 Sem 2/Sem 2 Assessment 1 Wk 9
Marking Guide to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents
Students' work to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents

ELECTRICAL MACHINES ONLINE REFERENCES

G003+G004+G009Practicals.pdf (12.48MB)
http://www.filefactory.com/file/1ervyinu9f9p/n/G003+G004+G009Practicals.pdf

Generator Test.pdf (0.61MB)
http://www.filefactory.com/file/1ro58odzv66b/n/Generator_Test.pdf

MachineRepair3.zip (3.61MB)
http://www.filefactory.com/file/26197nmhm9xp/n/MachineRepair3.zip

G044+7762AC2.zip (5.45MB)
http://www.filefactory.com/file/2i0lvwmkuuo1/n/G044+7762AC2.zip

E029 Motor Control 1.zip (13.32MB)
http://www.filefactory.com/file/2quq5jmokorv/n/E029_Motor_Control_1.zip

MachineControlCkt2.zip (7.64MB)
http://www.filefactory.com/file/351e0jbndf6v/n/MachineControlCkt2.zip

8PowerElectronicsDevices.zip (5.6MB)
http://www.filefactory.com/file/3qlpzhajv63z/n/8PowerElectronicsDevices.zip

MachineRepair1.zip (6.25MB)
http://www.filefactory.com/file/49rtbxh0lat1/n/MachineRepair1.zip

G044+7762AC1.zip (5.86MB)
http://www.filefactory.com/file/4ui61pg2c08j/n/G044+7762AC1.zip

Power Transformer+Line-G040.zip (158.78MB)
http://www.filefactory.com/file/544vu4ngj3pr/n/Power_Transformer+Line-G040.zip

Elect Machine-G043+G044+G045.zip (118.53MB)
http://www.filefactory.com/file/59l01bsiz7jh/n/Elect_Machine-G043+G044+G045.zip

MachineControlCkt1.zip (9.7MB)
http://www.filefactory.com/file/5l2uobw1vkgd/n/MachineControlCkt1.zip

MachineControlCkt3.zip (16.13MB)
http://www.filefactory.com/file/67jxjmpmnurd/n/MachineControlCkt3.zip

MachineRepair2.zip (4.64MB)
http://www.filefactory.com/file/709idhg8abzr/n/MachineRepair2.zip

7MachineDriveSystems.zip (8.36MB)
http://www.filefactory.com/file/c2musrlclul/n/7MachineDriveSystems.zip

G040_7762AD_Notes.doc (9.24MB)
http://www.filefactory.com/file/ga7n81yn8zv/n/G040_7762AD_Notes.doc

E029 Motor Control 2.zip (14.8MB)
http://www.filefactory.com/file/t5nysdqpby3/n/E029_Motor_Control_2.zip

G044 Tutorial.doc (4.05MB)
http://www.filefactory.com/file/uc45qc6va87/n/G044_Tutorial.doc

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with G145A Assessment Mapping+Performance+Marking Guide.pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	UEEEL0043 - Develop engineering solutions for induction machine and control problems		

Copy and paste the following table for each element as required

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1.Prepare to developengineering solution for synchronous machine problems	1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures	Test 1 Q1+2 of G145A Assessment Mapping+Performance+ Marking Guide.pdf Page 1		
	1.2	Established OHS risk control measures and procedures	Test 1 Q3+4of G145A Assessment Mapping+Performance+ Marking Guide..pdf Page 2		
	1.3	The extent of the machine problem is obtained from documentation and from work supervisor to establish the scope of work to be undertaken.		Practical 1, 2,3,4 of G145A Assessment Mapping+Performance +Marking Guide.pdf Page 4+5	
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work.		Observation in Practical 1, 2,3,4 of G145A Assessment Mapping+Performance +Marking Guide.pdf Page 4+5	
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.			Advanced Diploma in Electrical Engineering Exercises Page 208) Q 11, 12
2. Develop engineering solution for induction	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.	As per 1.1,1.2,1.3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
machine problems.					
	2.2	Knowledge of induction machine construction, operation, characteristics and applications are applied to developing solutions to synchronous machine problems.	Test 1 Q1 to 12 of G145 A Assessment Mapping+Performance+ Marking Guide.pdf Page 6 to 8		
	2.3	Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures	As above		
	2.4	Approaches to resolving synchronous machine problems are analysed to provide most effective solutions.	As above		
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.	As above		
3 Test, document and implement engineering solution for induction machine problem.	3.1	Solutions to machine problems are tested to determine their effectiveness and modified where necessary.	Q 7 of Test 3 Q 1 to 12 of Test 4		
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed	Q 7 of Test 3 Q 1 to 12 of Test 4		
	3.3	Appropriately competent and qualified person(s) required to implement solutions to synchronous machine problems are coordinated in accordance with regulatory requirements and enterprise policy	Q 7 of Test 3 Q 1 to 12 of Test 4		
	3.4	Justification for solutions used to solve synchronous machine problems is documented for inclusion in work/project development records in accordance with professional	Q 7 of Test 3 Q 1 to 12 of Test 4		

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Three phase motor No Load Test		Practical 1	
Three phase motor speed measurement		Practical 2	
Testing motor winding impedance		Practical 3	
Testing motor winding polarity		Practical 4	
Three phase induction motor winding design diagram			Project 1

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 Operating principles of polyphase induction motors	Test 2 Q1 +2 of G145 A Assessment Mapping+ Performance+ Marking Guide.pdf Page 9		
T2 Construction of polyphase induction motors	Test 2 Q 4+5 of G145 A Assessment Mapping+ Performance+ Marking Guide.pdf Page 9		
T3 Speed-torque relationships in induction motors	Test 2 Q 9, 10, 25 of G145 A Assessment Mapping+ Performance+ Marking Guide.pdf Page 10+11		
T4 Induction motor performance testing	Test 2 Q 26+27 of G145 A Assessment Mapping+ Performance+ Marking Guide.pdf Page 12		

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T5 Induction motor starters		Refer Practical 6 of UEENEEG006A Direct Online Motor Starter Forward/ Reverse Motor Starter Investigation	Test 2 Q 31+32 of G145 A Assessment Mapping+ Performance+ Marking Guide.pdf Page 13
T6 Reduced voltage starting			Advanced Diploma in Electrical Engineering Exercises Page 164) Q 46 to 51
T7 Speed control of induction motors			Advanced Diploma in Electrical Engineering Exercises Page 165) Q 54, 55, 60
T8 Braking of induction motors			Advanced Diploma in Electrical Engineering Exercises Page 165) Q 54, 55, 60
T9 Motor protection			Advanced Diploma in Electrical Engineering Exercises Page 165) Q 62,63

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T10 Motor selection criteria and RMS rating			Advanced Diploma in Electrical Engineering Exercises Page 171) Q 110 to 123
T12 Single phase induction motors			Advanced Diploma in Electrical Engineering Exercises Page 171) Q 105, 106

Add rows to the following table as required

Assessment Conditions	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments Records relating to electrical engineering resources	Test 1, 2, 3,4	Practical	All assignments+ Project

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UEENEEG145A Develop engineering solutions for induction machine

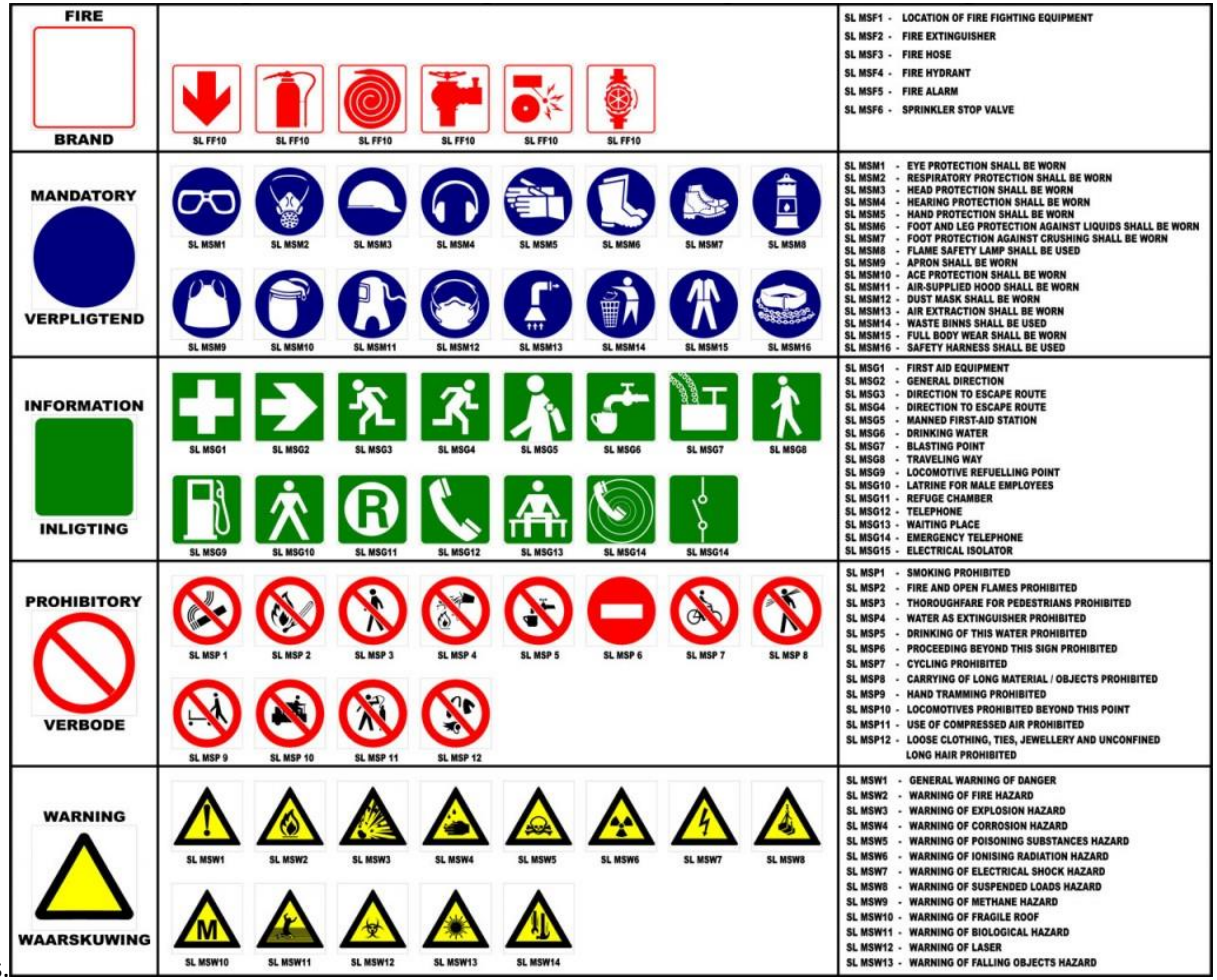
UNIT CAPSTONE ASSESSMENT

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

1 1 Prepare to developengineering solution for synchronous machine problems

1.1	OHS procedures for a given work area are obtained and understood through established routines and procedures.

Q1. Identify safety equipments & signs to be used when you are using fitting & machining process.



Answers +Marking Guide (2 marks)

Safety glass

Safety glove

Safety shoe

Ear protection

First aids sign

Q2 Write the safety procedure to operate the drilling machine

Answers +Marking Guide (5 marks)

PRE-OPERATIONAL SAFETY CHECKS

1. **Check workspace and walkways to ensure no slip-hazards are present.**
2. **Check that the drill chuck guard is in position.**
3. **Ensure the chuck key (if used) has been removed from the drill chuck.**
4. **Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).**
5. **Follow correct clamping procedures to ensure work is secure.**
6. **If the job obstructs the walkway erect a barricade.**
7. **Adjust spindle speed to suit drill or cutter diameter.**
8. **Faulty equipment must not be used. Immediately report suspect equipment.**

OPERATIONAL SAFETY CHECKS

1. **Never leave the Drill Press while it is running.**
2. **Before making adjustments or before cleaning swarf accumulations switch off and bring the machine to a complete standstill.**
3. **Feed downwards at a sufficient rate to keep the drill cutting.**
4. **Feed with care as the drill breaks through the underside of the work.**
5. **Use a safe working posture (beware of hair catching).**

HOUSEKEEPING

1. **Switch off the machine.**
2. **Leave the machine in a safe, clean and tidy state.**

POTENTIAL HAZARDS

- **Hair/clothing entanglement - rotating spindle/drill**
- **Eye injuries**
- **Flying swarf/chips**
- **Sharp edges & burrs**

1.2 Established OHS risk control measures and procedures

Q3 What are the main source of hazards to use the drilling machine?

Answers +Marking Guide (5 marks)

(1)Hazards related to the machinery or plant, materials or items being processed or internal sources of energy, for example:
- drawing in or trapping hazards;
- entanglement hazards;

- shearing hazards;
- cutting hazards;
- impact hazards;

(2)hazards related to the location of the machine or plant, for example:
- its stability, for instance, whether it could roll or fall over;

(3)hazards related to systems of work associated with the machine or plant, for example manual handling injuries caused when putting materials into them.

To prevent the hazards, the above risks are to be identified & eliminated.

Q4.Write WHS Duty of Care Checklist for Managers/Supervisors

Answers +Marking Guide (8 marks)

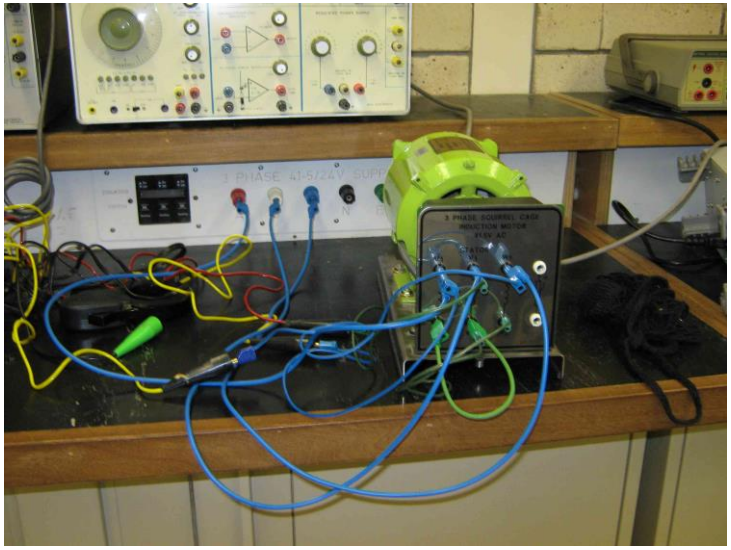
WHS Duty of Care Checklist for Managers/Supervisors

- Familiarise yourself with the organization Work Health & Safety Policy 2016 and Work Health and Safety Procedures to ensure you are aware of your personal responsibility for workplace health and safety (WHS) within your area of delegated authority.
- Ensure that the work for which you are responsible is carried out in accordance with the University's WHS risk management steps to safeguard the health, safety and wellbeing of those involved and others who may be affected.
- Demonstrate active and visible leadership in WHS risk management. Identify hazards or WHS risks associated with different jobs, tasks and projects and assess the risks to the health and safety of those involved. Conduct this risk identification and assessment in consultation with those involved or affected.
- Implement suitable risk controls within agreed timeframes. These may include competency based training, adequate supervision and adoption of safe operating procedures. Choose these risk controls in consultation with those involved or affected.
- Inform staff, students and contractors of WHS requirements and expectations, directing them to relevant information and risk control resources available. This may include local WHS induction (refer to the WHS induction checklist), on-the-job instruction and specific WHS training.
- Promptly address WHS issues that are brought to your attention in consultation with those involved or affected.
- Refer WHS issues that are beyond your control to the relevant manager(s) for their attention, but ensure that interim action is taken to reduce the risks in a practical way.
- Investigate incidents, seeking to identify the causes and take steps to prevent recurrence.

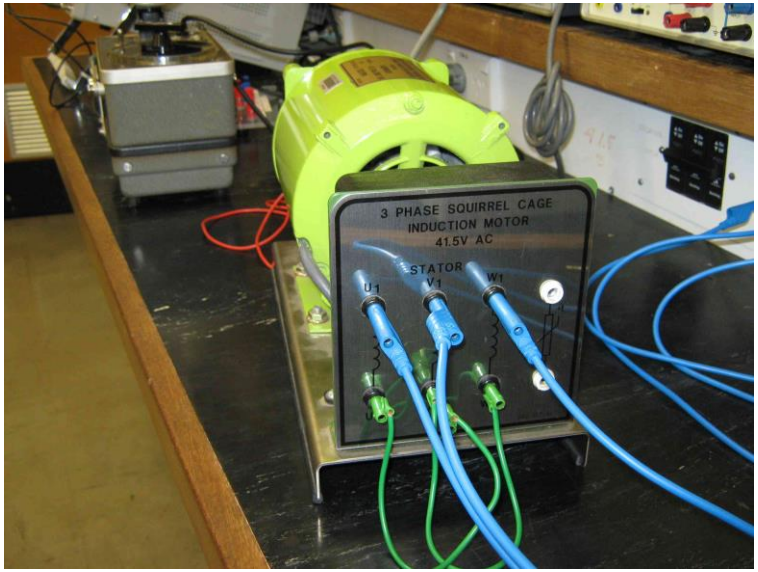
1.3 The extent of the machine problem is obtained from documentation and from work supervisor to establish the scope of work to be undertaken.

The performance characteristics of AC Induction Motors are to be assessed by performing the following practical tasks.

Practical 1-Three phase motor No Load Test

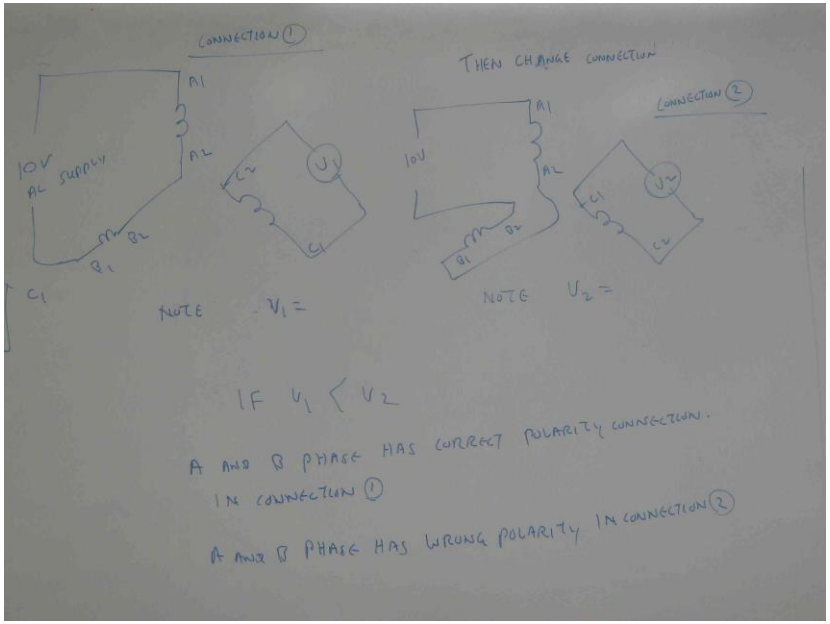


Practical 2 Three phase motor speed measurement



Practical 3 Testing motor winding impedance

Practical 4 Testing motor winding polarity



Students performance in the practical is assessed.

1.4 Activities are planned to meet scheduled timelines in consultation with others involved in

the work.

Students cooperation & performance in the practical is assessed.

1.5 Effective strategies are formed to ensure solution development and implementation is carried out

1.5Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 208)

(3) Strategy objective

Slide 1+2
Q11.What are the developing of strategies in project?
Q12.How will you examine the effectiveness of activities in project management?

Students co-operation in the practical is evaluated.

2 Develop engineering solution for induction machine problems.	
2.1	Established OHS risk control measures and procedures for carrying out the work are followed.

As per 1.1, 1.2 & 1.3

2.2 Knowledge of induction machine construction, operation, characteristics and applications are applied to developing solutions to synchronous machine problems.

2.3 Parameters, specifications and performance requirements in relation to each machine problem are obtained in accordance with established procedures.

2.4 Approaches to resolving induction machine problems are analysed to provide most effective solutions.

2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.

2.6 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

ASSESSMENT

The students' performance in the following questions are to be assessed.

1.Explain the operation principle of capacitor start motor.

(3 marks)

2. Sketch the vector diagram of capacitor run motor.

(3 marks)

3. Sketch the circuit diagram of capacitor run motor.

(3 marks)

4.How will you reverse the direction of the rotation of single phase motor.

(1 marks)

5.Explain the operation of shaded pole motor.

(3 marks)

6. A small 60Hz hysteresis clock motor possesses 32 poles. In making one complete turn with respect to the revolving field, the hysteresis loss in the rotor amounts to 0.8J

(i) Calculate (a) The pull in and pull out torques (b) The maximum power out put before the motor stalls (c) The rotor losses when the motor is stalled (d) The rotor losses when the motor runs at synchronous speed.

(4 marks)

7. State (i) Locked rotor torque (ii) Breakdown torque

(ii) Sketch the shaded pole and indicate the direction of rotation.

(3 marks)

8. Sketch the connection of universal motor.

(2 marks)

9. Compare advantages and disadvantages of 1 phase and 3 phase motors.

(2 marks)

10.What are the abnormal operating conditions for AC induction motors.

(2 marks)

11. A large reel of paper installed at the end of paper machine has a diameter of 1.8 m a length of 5 .6 m and a moment of inertia of 4500 kg-m^2. It is driven by a directly coupled variable speed dc motor turning at 120rpm. The paper is kept under a constant tension of 6000N.

(a) Calculate the power of the motor when the reel turns at a constant speed of 120 rpm

(b) If the speed has to be raised from 120 rpm to 160 rpm in 5 s , calculate the torque that the motor must develop during this interval.
(c) Calculate the power of the motor after it has reached the desired speed of 160 rpm.
(d) Calculate the power of the motor after it has reached the desired speed of 160 rpm.

(8 marks)

12. A motor has been idle for several days in an ambient temperature of 19 deg C is found to have a field resistance of 22 ohm. The motor then operates at full load and when temperatures have stabilized, the field resistance is found to be 30 ohm. The corresponding ambient temperature is 24 deg C. If the motor is built with class B insulation.

Calculate the followings

i. The average temperature of the winding at full load
ii. The full load temperature rise by the resistance method.
iii. Whether the motor meets the temperature standards.

(6 marks)

3 Test, document and implement engineering solution for induction machine problem.

3.1 Solutions to machine problems are tested to determine their effectiveness and modified

where necessary.

3.2 Adopted solutions are documented including instruction for their implementation that

incorporates risk control measure to be followed.

3.3 Appropriately competent and qualified person(s) required to implement solutions to synchronous machine problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)

3.4 Justification for solutions used to solve synchronous machine problems is documented for inclusion in work/project development records in accordance with professional

EKAS Assessment

DELIVERY TO ACHIEVE THE COMPETENCY

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

www.electricaldiploma2013.webs.com

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

Elect Machine-G043+G044+G045.zip

Electrical Machines

AC Machines 1

AC Machines 2

The students will have to answers the following questions

(1) AC Machine introduction

Slide 1+2+3

Q1.Derive the formula to calculate rotating magnetic field.

Slide 4+5

Q2.Calculate the synchronous speed of a three phase induction motor having 12 poles , 60HZ.

Slide 6

Q3.Explain the starting characteristics of squirrel cage motor.

Slide 7.

Q4.Sketch the construction of squirrel cage induction motor and wound rotor motor.

Slide 8+9+10+11+12

Q5.Design three phase 48 slots 4 poles winding.

---

(2) Induction motor

Slide 1

Q6.What is distribution factor?

Slide 2

Q7.What is coil span factor?

Slide 3

Q8.How do distribution factor & coil span factor affect the induced emf ?

Slide 4+5

Q9.A 0.7 HP 4 poles induction motor is excited by a single phase 540HZ source is full load speed is

1160 rpm. Calculate the slip.

Slide6+7

Q10.The 4 pole wound rotor induction motor is excited by a three phase 50HZ . Calculate the

frequency of the rotor currentunder the following conditions.

(a) At stand still

158

(b) Motor turning at 600 rpm in the same direction as the revolving field.

(c) Motor turning at 600 rpm in the opposite direction to the revolving field.

(d) Motor turning at 1800 rpm in the same direction to the revolving field.

Slide 8+9+10

Q11.(a) Calculate the approximate full load current . locked rotor current and no load current of a

three phase induction motor having a rating of 600HP, 2400V.

(b)Estimate the apparent power drawn under locked rotor conduction.

(c) State the normal rating of this motor expressed in kilowatt.

---

(3) Motor equivalent circuit.

Slide 1+2

Q12.Sketch the equivalent circuit & equation of induction motor.

---

(4) Wound rotor motor

Slide 1

Q13.Sketch DOL starter

Q14.Write equations for locked rotor current & locked rotor torque.

Slide 2+3+4

Q20.Write the equation for motor current at stand still condition & any slip.

Q21.A 440V 6 poles three phase 50 HZ induction motor has its winding delta connected & its rotor winding star connected. The standstill voltage measured between slip ring with the rotor open circuit 220V. The stator resistance / phase is 0.7 ohm and the stator reactance / phase is 5 ohm. The rotor resistance per phase is 0.07 ohm and rotor reactance per phase is 0.3 ohm. Calculate the rotor current and stator current when slip rings are short circuited to start the motor. Calculate rotor power factor & stator power factor.

Slide 5

Q22.In above problem , calculate rotor current and stator current when slip rings are connected to 5 ohm external resistance and motor is running at 0.04 slip.

Slide 6

Q23.Sketch power transfer in induction machine for (a) motor mode (b) generator mode.

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Slide 7+8

Q24.Write the following equations.

(a) Power absorbed by ideal stator winding

(b) Power dissipated in rotor circuit.

(c) Mechanical power

(d) Power dissipated in rotor resistance

(e) Rotor circuit power loss

(f) Power absorbed by ideal stator winding.

Slide 9

Q25.A 400 V 4 poles three phase 60HZ slip ring induction motor has its stator winding delta connected and rotor winding star connected. The standstill voltage measured between slip rings with the rotor open circuited is 220V. The stator resistance per phase is 4 ohm. The rotor resistance per phase is 0.08 ohm and the rotor reactance per phase is 0.35 ohm. Calculate the maximum torque & slip.

---

(5) Torque +Motor test

Slide 1

Q26.Sketch the power flow diagram in motor.

Q27.Write the equation for

(a) Mechanical power developed by rotor

(b) Mechanical power delivered to load.

(c) Mechanical torque.

---

(6) Synchronous speed + Slip + Power of motor

Slide 1

Q28.A three phase induction motor having synchronous speed of 1200 rpm draws 90kw from three phase feeder. Copper loss & iron loss in stator amount to 7kw. If the motor runs at 1140 rpm, calculate the followings.

(a) Active power transmitted to the rotor

(b) Rotor I 2 R loss.

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(c) Mechanical power developed.

(d) The mechanical power delivered to the load knowing that the windage & friction losses are equal to 1.5 kw.

(e) The efficiency of motor.

Slide 2+3

Q29.A three phase 8 poles squirrel cage induction motor connected to 50Hz line possesses a rotor speed 1000 rpm. The motor absorbs 45kw and the copper & iron losses in the stator to 6 kw & 2 kw respectively. Calculate the torque developed by motor.

Slide 3+4

Q30.A three phase induction motor having a nominal rating of 80 kw and synchronous speed of 1800 rpm is connected to 660V source. Two meters method show a total power consumption 80kw and an ammeter indicates a line current 77 amp. Rotor speed is 1750 rpm. The following ratings are obtained. Stator iron loss = 2.5 kw, windage and friction loss = 1.5 kw. Resistance between two

stators = 0.3 ohm.

Calculate (a) Power supplied to the rotor.

(b) Rotor I 2 R loss

(c)Mechanical power supplied to the load

(d)Efficiency

(e)Torque developed at 1750 rpm.

---

(7) Motor starters

Slide 1+2

Q31.Describe the motor reduced voltage starting methods.

Slide 3+4+5+6

Q32.Sketch DOL starter.

---

(8) Three phase motor equivalent circuit

Slide 1+2+3

Q33.Explain the tests to determine the equivalent circuit of three phase motor.

Slide 4+5

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Q34.A no load test conducted on a 50HP 900 rpm 415 V three phase 50HZ squirrel cage induction

motor yield the following results

No load test

No load voltage (L- L) = 415V

No load current = 15 A

No load power = 1450 watt

Resistance measured between two terminals

Locked rotor test

The locked rotor test conducted at reduced voltage gave the following results

Locked voltage (L to L) = 170V

Locked rotor power = 7500w

Locked rotor current = 70A

Determine the equivalent circuit of motor.

Refer Question & Marking Scheme for Tests

EKAS Components	Assessment Tasks
KS01-EG145A Induction machines diagnostics Evidence shall show an understanding of developing engineering solutions for induction motor problems to an extent indicated by the following aspects: T1 Operating principles of polyphase induction motors encompassing:	SAG Sem 2-2016 –U Kyaw Naing (Joe)/ASSESSMENT Mapping –Sem 2-2016/G143+145 Assessment Mapping/G143+145 Tests www.electricaldiploma2013.webs.com **Youtube Videos for Electrical Engineering Lessons** G043+G045+ G143+145+I145 Page 308 to 329 of

▯ rotating magnetic field torque slip ▯ MMF relationships ▯ Leakage fluxes T2 Construction of polyphase induction motors encompassing: ▯ squirrel cage motors ▯ slip-ring motors ▯ construction considerations in minimisation of tooth locking T3 Speed-torque relationships in induction motors encompassing: ▯ maximum torque ▯ torque – slip relationships ▯ squirrel cage rotor types ▯ power flow in the motors ▯ power distribution ▯ torque units ▯ slip ring rotors T4 Induction motor performance testing encompassing: ▯ no-load test	http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf **Induction and synchronous machines & control** G043+G045 Lesson 1 AC Machine Introduction.zip http://youtu.be/-WlfOPhNDn8 G043+G045 Lesson 2 Slip+Equivalent Ckt.zip http://youtu.be/De79cbk2EOQ http://youtu.be/gprZTitiOao G043+G045 Lesson 3 Power Transfer.zip http://youtu.be/pCMcMPBrUEE http://youtu.be/7tJjDuG5SQc http://youtu.be/dV9VFsXeFnY G043+G045 Lesson 4 Test for equivalent ckt.zip http://youtu.be/HF4bJ6vWX2c G043+G045 Lesson 5 Equivalent Ckt Problems.zip http://youtu.be/PyPQsw0L_o0 http://youtu.be/f8VbD_APNfk http://youtu.be/SROLC5hkoc0 G043+G045 Lesson 6 Motor starting and control.zip

locked rotor tests - development of motor equivalent circuit from test results - analysis of motor performance using circle diagrams T5 Induction motor starters encompassing: - starting requirements - type of starters - starting torque - starting dynamics - static friction - mechanical loads - starting duration T6 Reduced voltage starting encompassing: - starting dynamics - change over conditions - starting duration - acceleration curves T7 Speed control of induction motors encompassing: - constant torque, constant power concepts	http://youtu.be/Utfbzs7Ti6M http://youtu.be/VnNlesPgeZk http://youtu.be/AMO70oGS2Fs http://youtu.be/FQVMCMDSTwo G043+G045 Lesson 7 Synchronous machine introduction.zip http://youtu.be/KM9TJcr2MBk G043+G045 Lesson 8 Synchronous machine ckt problems.zip http://youtu.be/ZGsmZfLiPoc http://youtu.be/bnpYxKtSz1c G043+G045 Lesson 9 Synchronous machine starting.zip http://youtu.be/p4x03LkgBc8 http://youtu.be/yKmNWaxT2Hk G043+G045 Lesson 10 Single phase motor.zip http://youtu.be/9OgmEb0tFpE G043+G045 Lesson 11 Factors affecting motor operation.zip http://youtu.be/sAqyhDlpwwY

▯ torque-flux-voltage relationships ▯ rotor resistance control ▯ stator impedance control ▯ variable frequency control (e.g. PAM, PWM, Flux vector control) T8 Braking of induction motors encompassing: ▯ electrical braking systems (plugging, d.c. dynamic, regenerative, capacitor-magnetic) ▯ mechanical braking systems (mechanical drum, demag, eddy current) T9 Motor protection encompassing: ▯ overload ▯ earth fault ▯ phase failure T10 Motor selection criteria and RMS rating T11 Induction motor maintenance/repair encompassing: ▯ routine maintenance schedules ▯ type of repairs (mechanical, electrical) T12 Single phase induction motors encompassing:	

operating principles (especially RMF) construction types speed-torque relationships testing	

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1	X		
1.2	X		
1.3	X	X	
1.4		X	X
1.5		X	X
2.1	X		
2.2		X	X
2.3		X	X
2.4		X	X
2.5		X	X
2.6		X	X
2.7		X	X
3.1		X	X
3.2		X	X
3.3		X	X
3.4		X	X
EKAS Assessment		X	X

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Theory Test Assessment SAG Sem 2-2016 –U Kyaw Naing (Joe)/ASSESSMENT Mapping –Sem 2-2016/G143+145 Assessment Mapping/G143+145 Tests G143 & G145 are assessed concurrently. **ASSESSMENT QUESTIONS IN THE TESTS ARE BASED ON THE QUESTIONS ATTACHED WITH THIS ASSESSMENT MAPPING, BUT IN ACTUAL ASSESSMENT,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME**
Students' work in own record	Summative Assessment- Formal Tests	Record 2016/Students/TAFE/Sem 1 2016/Sem 1 2016 Students work assessment 2/G143 Assessment 2
	Formative Assessment/Practical+ Class works	Presented students' practical work report Record 2016/Students/TAFE/2015 Sem 2/Sem 2 Assessment 1 Wk 9
Marking Guide to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents
Students' work to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents

ELECTRICAL MACHINES ONLINE REFERENCES

G003+G004+G009Practicals.pdf (12.48MB)
http://www.filefactory.com/file/1ervyinu9f9p/n/G003+G004+G009Practicals.pdf

Generator Test.pdf (0.61MB)
http://www.filefactory.com/file/1ro58odzv66b/n/Generator_Test.pdf

MachineRepair3.zip (3.61MB)
http://www.filefactory.com/file/26197nmhm9xp/n/MachineRepair3.zip

G044+7762AC2.zip (5.45MB)
http://www.filefactory.com/file/2i0lvwmkuuo1/n/G044+7762AC2.zip

E029 Motor Control 1.zip (13.32MB)
http://www.filefactory.com/file/2quq5jmokorv/n/E029_Motor_Control_1.zip

MachineControlCkt2.zip (7.64MB)
http://www.filefactory.com/file/351e0jbndf6v/n/MachineControlCkt2.zip

8PowerElectronicsDevices.zip (5.6MB)
http://www.filefactory.com/file/3qlpzhajv63z/n/8PowerElectronicsDevices.zip

MachineRepair1.zip (6.25MB)
http://www.filefactory.com/file/49rtbxh0lat1/n/MachineRepair1.zip

G044+7762AC1.zip (5.86MB)
http://www.filefactory.com/file/4ui61pg2c08j/n/G044+7762AC1.zip

Power Transformer+Line-G040.zip (158.78MB)
http://www.filefactory.com/file/544vu4ngj3pr/n/Power_Transformer+Line-G040.zip

Elect Machine-G043+G044+G045.zip (118.53MB)
http://www.filefactory.com/file/59l01bsiz7jh/n/Elect_Machine-G043+G044+G045.zip

MachineControlCkt1.zip (9.7MB)
http://www.filefactory.com/file/5l2uobw1vkgd/n/MachineControlCkt1.zip

MachineControlCkt3.zip (16.13MB)
http://www.filefactory.com/file/67jxjmpmnurd/n/MachineControlCkt3.zip

MachineRepair2.zip (4.64MB)
http://www.filefactory.com/file/709idhg8abzr/n/MachineRepair2.zip

7MachineDriveSystems.zip (8.36MB)
http://www.filefactory.com/file/c2musrlclul/n/7MachineDriveSystems.zip

G040_7762AD_Notes.doc (9.24MB)
http://www.filefactory.com/file/ga7n81yn8zv/n/G040_7762AD_Notes.doc

E029 Motor Control 2.zip (14.8MB)
http://www.filefactory.com/file/t5nysdqpby3/n/E029_Motor_Control_2.zip

G044 Tutorial.doc (4.05MB)
http://www.filefactory.com/file/uc45qc6va87/n/G044_Tutorial.doc

Advanced Diploma in Electrical Engineering Exercises

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Assessment Mapping - UEENEEI151A Develop, enter and verify word and analogue control programs for programmable logic controllers.

Faculty:	**Construction, Engineering & Transport**	**College:**	
Teaching Section:	Management & Business Administration		
Qualification Number and Name:	Engineering Technology – Electrical		
Unit of Competency Number and Name:	UEEIC0015 - Develop, enter and verify word and analogue control programs for programmable logic controllers		

Elements & Performance Criteria			**Assessment event(s)**		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Workplace Simulations**	**Machine Safety Standards Assignment**	**Theory Test**
1Prepare to develop industrial control systems programs	1.1	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.	Workplace Sim 1 , repeated in 2 and 3		Section 1 question 9
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work.	Workplace Sim 1 , repeated in 2 and 3		Section 1 question 9
	1.3	Mode of operation of the control system is determined from job specifications of the process/plant/machine to be controlled, and through consultation with appropriate person(s).	Workplace Sim 1 , repeated in 2 and 3		Section 1 question 9
	1.4	Equipment, software and testing devices needed to carry out the work are obtained and checked for correct operation and safety.	Workplace Sim 1 , repeated in 2 and 3		Section 1 question 9
	1.5	Installation of programmable controller is checked for compliance with regulations and job specification.	Workplace Sim 1 , repeated in 2 and 3		Section 1 question 9

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Workplace Simulations**	**Machine Safety Standards Assignment**	**Theory Test**
	1.6	OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.	Workplace Sim 1 , repeated in 2 and 3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Workplace Simulations**		**Theory Test**
2.Develop and enter and programs for industrial control systems.	2.1	Established OHS risk control measures and procedures for carrying out the work are followed.	Workplace Sim 1 , repeated in 2 and 3		Section 1 question 10 , 12
	2.2	Control solutions are developed and documented based on the operational mode and using acceptable methods for designing control system that contain numeric variables and values.	Workplace Sim 2 and 3		Section 1 question 10 , 12
	2.3	Developed control solution is entered using a personal computer and software applicable to the programmable controller.	Workplace Sim 1 , 2 and 3		Section 2
	2.4	Programming elements are written and used to manipulate word data. (See Note 1)	Workplace Sim 2 and 3		Section1 Q1-6 and 14

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Workplace Simulations**		**Theory Test**
	2.5	Program control values are assigned using applicable numbering systems and codes. (See Note 2)	Workplace Sim 2 and 3	Question1	Section1 Q1-6 and 14
	2.6	Programs are written to read and write analogue signals, both with and without.	Workplace Sim 2 and 3	Question1	
	2.7	Arithmetic functions are used to scale analogue inputs to a specified engineering span.	Workplace Sim 2 and 3	Question1	Section1 Q1-6 and 14
	2.8	Arithmetic functions are used to un-scale an engineering value to drive an analogue output.	Workplace Sim, 2 and 3	Question1	Section1 Q1-6 and 14
	2.9	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.	Workplace Sim 1 , repeated in 2 and 3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Workplace Simulations**	**Machine Safety Standards Assignment**	**Theory Test**
3. Monitor, verify and document programming activities.	3.1	Device operation is tested in strict accordance OHS requirements and procedures.	Workplace Sim 1 , 2 and 3		Section 2
	3.2	Entered instructions and settings are tested as meeting those specified for the control mode requirements.	Workplace Sim 1 , 2 and 3		
	3.3	Appropriate methods and tools are used to test and monitor control programs and operating faults, anomalies are identified and rectified. (See Note 3)	Workplace Sim 1 , 2 and 3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Workplace Simulations**	**Machine Safety Standards Assignment**	**Theory Test**
	3.4	OHS work completion risk control measures and procedures are followed.	Workplace Sim 1 , 2 and 3		
	3.5	Control system specification and program are documented in accordance with established procedures.	Workplace Sim 1 , 2 and 3		

Performance Evidence	Workplace Simulations	Machine Safety Standards Assignment	Theory Test
Developing a control system solution to the required operating functions and parameters.	Workplace Sim 1 , 2 and 3		
Identifying non-compliance conditions of device installation.	Workplace Sim 1 , 2 and 3		
Converting control system to a PLC program.	Workplace Sim 1 , 2 and 3		
Entering programming functions and parameters correctly.	Workplace Sim 1 , 2 and 3		
Transferring programs to a PLC.	Workplace Sim 1 , 2 and 3		
Correcting programming anomalies.	Workplace Sim 1 , 2 and 3		
Testing and verify control system operation.	Workplace Sim 1 , 2 and 3		
Transferring program to external storage.	Workplace Sim 1 , 2 and 3		
Documenting control system and programming clearly.	Workplace Sim 1 , 2 and 3		
Dealing with unplanned events by drawing on required skills and knowledge to provide appropriate solutions incorporated in a holistic assessment with the above listed items.	Workplace Sim 1 , 2 and 3		

Knowledge Evidence	Workplace Simulations		Theory Test
• Software – enter/test /transfer/simulate	Workplace Sim 1 , 2 and 3		Section2

Knowledge Evidence	Workplace Simulations		Theory Test
• Use Jumps / Blocks / Structured Programming	Workplace Sim 1 , 2 and 3		Section1 and 2
• Statement List programming	Workplace Sim 1 , 2 and 3		
• Data manipulation and storage /Data Blocks	Workplace Sim 1 , 2 and 3		Section 2
• Word manipulation – Masking /shifting	Workplace Sim 1 , 2 and 3		Section 2
• Using Functions and re-usable code	Workplace Sim 1 , 2 and 3		Section 2
• Math functions and data manipulation	Workplace Sim 1 , 2 and 3		Section 2
• Indirect Addressing	Workplace Sim 1 , 2 and 3		Section 2
• Analog Value Processing – Scaling , addressing	Workplace Sim 1 , 2 and 3		Section 2
OH&S – Safety / PLC Safety	Workplace Sim 1 , 2 and 3		Section 1 question 10 , 12

Assessment Conditions	Workplace Simulations	Machine Safety Standards Assignment	Theory Test

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – Evidence shall also comprise:
• A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  • Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  • Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  • Demonstrate an understanding of the required skills and knowledge as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  • Demonstrate an appropriate level of skills enabling employment
  • Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
	Cover all Practical Applications		Final Assessment of knowledge.

2. Assessors must satisfy NVR/AQTF assessor requirements. (*Insert Hyperlink to evidence*)	Faculty- MEE Qualifications ElecEngteachers skill matrix

Created by (Name)	Keith Williamson	**Date created**	**6/6/2016**
Approved by (Name)	Michael Moulton	**Date approved**	**6/6/2016**
Signature		**Date modified**	

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with K151A Assessment Mapping+Performance .pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	UEERE0012 - Develop effective engineering strategies for energy reduction in buildings		

Copy and paste the following table for each element as required

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1.Prepare to develop strategies for effective energy reduction in buildings	1.1	OHS procedures for a given work area are identified, obtained and understood	Q1 of K151A Assessment Mapping+ Performance .pdf (Page 1)		
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work	Q2 of K151A Assessment Mapping+ Performance .pdf (Page 1)		
	1.3	The extent of evaluation is determined from specifications of building(s) and services, plant and machinery and discussed with appropriate personnel	Q1 ,2, 5 of Test 1		
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others		Observation Assessment Mapping+ Performance .pdf (Page 2)	
	1.5	Tools, testing devices, and materials needed to carryout the work are obtained and checked for correct operation and safety	Q3, 4 of Test 1		
2 Develop strategies for effective energy reduction in buildings.	2.1	OHS risk control measures and procedures for carrying out the work are followed	Q2 of K151A Assessment Mapping+ Performance .pdf (Page 3)		
	2.2	Tests and measurements are carried out in strict accordance with OHS requirements safety procedures	Q6, 8 of Test 2		
	2.3	In-depth knowledge of the energy use of building services, plant and machinery is applied to the	Q1a of Test 2	**Practical (1)** Measure energy	Advanced Diploma in Electrical

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
		evaluation process		usage in the building .	Engineering Exercises (Page 271/272) Q1 to 27
	2.4	Energy evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny	Q3,4 of Test 2		Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q62 to 72
	2.5	Strategies to reduce energy use with compromising occupancy standards are developed from knowledge of energy management and evaluation			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q84 to 102
	2.6	Unexpected situations are dealt with safely and with the approval of an authorised person		Q4 of K151A Assessment Mapping+ Performance .pdf (Page 10)	
	2.7	Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practice		Observation – Practical 2 Solar panel installation practical	
3 Document and report strategies for effective energy reduction in buildings	3.1	OHS work completion risk control measures and procedures are followed	As per 1.1 & 1.2		
	3.2	Work site is cleaned and made safe in accordance with established procedures		Observation – Housekeeping Activity	
	3.3	Results of energy use evaluation and recommended strategies			Advanced Diploma

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
		and their criterion for energy reduction are documented in accordance with established procedures			in Electrical Engineering Exercises (Page 271/272) Q103 to 115
	3.4	Energy reduction report is forwarded to appropriate persons		Practical 3-Preparing energy reduction plan report	

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Risk assessment in installing solar panel on rooftop	Q1,2 of K151A Assessment Mapping+ Performance .pdf (Page 1)		
Passive solar design, Assessing comfort conditions			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q1 to 27
Ventilation system design & application of psychrometric chart, Determination of energy usage			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q62 to 72
Measure energy usage in the building		Practical 1	
Solar panel installation		Practical 2	

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Design for climate, Determining Solar effect & wind condition.			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q84 to 102
Matching solar panel to load		Q4 of K151A Assessment Mapping+ Performance .pdf (Page 10)	
Energy use evaluation and recommended strategies			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q103 to 115
Energy reduction report preparation		Practical 3	

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 Climate and thermal comfort	Test 2 Q6		
T2 Solar geometry and radiation	Test 1 Q2		
T3 Heat transfer	Test 1 Q1 & Q6		
T4 Glazing Systems	Test 1 Q2		
T5 Insulation	Test 1 Q1 & Q5		
T6 Thermal mass	Test 1 Q1 & Q7		
T7 Comfort control strategies	Test 2 Q1a, Q6,Q7		

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T8 Energy efficiency in buildings + T11 Energy rating schemes			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q103 to 115
T10 Integration of active solar system			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q84 to 102
T12 Sustainable and safe building materials			Advanced Diploma in Electrical Engineering Exercises (Page 271/272) Q56 to 67

Assessment Conditions	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments • Records relating to electrical engineering resources	Test 1+2	Practical 1,2,3	All assignments

Created by (Name)	U Kyaw Naing (Joe)	Date created	16 August 2016

Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UEENEEK151A

Develop effective engineering strategies for energy reduction in buildings

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

1 Prepare to develop strategies for effective energy reduction in buildings

1.1 OHS procedures for a given work area are identified, obtained and understood

Q1. To install the solar panel on the roof top, outline the OHS aspects to be concerned.

Marking Guide+Question (4 marks)

- Precaution regarding working at height
- Precaution against electrocution due to panel terminal
- Precaution on insulation & heat resistance to protect heating
- Ensure the strength of roof trusses to withstand the weight of equipments and workmen.

1.2 Established OHS risk control measures and procedures are followed in preparation for the work

Q2. List the risk level associated with the tasks in the following table from 1 to 6. 1=The most serious, 6=least serious

Injury caused by falling down from the height	
Electrical fire caused by overheating of solar panels	
No matching of solar panel and inverter	
Electrical interruption when sun set due to lack of battery.	
Equipments damage due to electrical surge	
Appearance of solar panel	

Marking Guide+Question (6 marks)

Injury caused by falling down from the height	1
Electrical fire caused by overheating of solar panels	2
No matching of solar panel and inverter	4
Electrical interruption when sun set due to lack of battery.	6
Equipments damage due to electrical surge	3
Appearance of solar panel	5

1.3 The extent of evaluation is determined from specifications of building(s) and services, plant and machinery and discussed with appropriate personnel

Test 1 Question

Q1+Q2+Q5

1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively with others

Observation (10 marks)

The practical tasks will be performed by 2 teams

Duties of team 1

Determine total electrical usage by all electrical equipments in a home

Duties of team 2

Estimate the appropriate size of solar panel to meet the electrical usage

The co-ordination between two teams will be assessed.

1.5 Tools, testing devices, and materials needed to carryout the work are obtained and checked for correct operation and safety

Test 1 Q3+4

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 1/Question Marking scheme Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 1/ Assessment Cover Sheet Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 1/

		Assessment Feedback Sheet
Students' work in own record	Summative Assessment- Formal Tests	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 1/Student Work
	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/K151 Assessment 2 /Student Work Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 Part 1 2016 Attendance Records+Record Books
Marking Guide to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents
Students' work to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents

2 Develop strategies for effective energy reduction in buildings.

2.1 OHS risk control measures and procedures for carrying out the work are followed

Q3. Match the OHS risk & control activities

Injury caused by falling down from the height	Matching solar panel rating & inverter rating
Electrical fire caused by overheating of solar panels	Fall prevention system is utilized
No matching of solar panel and inverter	Design & arrangement according to plan
Electrical interruption when sun set due to lack of battery.	Installation of back up battery
Equipments damage due to electrical surge	Use of insulators under solar panel & proper air ventilation
Appearance of solar panel	Surge protector is applied

Marking Guide+Question (6 marks)

Injury caused by falling down from the height	Fall prevention system is utilized
Electrical fire caused by overheating of solar panels	Use of insulators under solar panel & proper air ventilation
No matching of solar panel and inverter	Matching solar panel rating & inverter rating
Electrical interruption when sun set due to lack of battery.	Installation of back up battery
Equipments damage due to electrical surge	Surge protector is applied
Appearance of solar panel	Design & arrangement according to plan

2.2 Tests and measurements are carried out in strict accordance with OHS requirements safety procedures

Test 2 Question 6+8

Advanced Diploma in Electrical Engineering Exercises (Page 273)

(3) Solar calculation , thermodynamic principle

Slide 1

Q35.Sketch solar irradiation diagram

Slide 2

Q36.Write the equation to calculate solar irradiation.

2.3 In-depth knowledge of the energy use of building services, plant and machinery is applied to the evaluation process

Test 2 Question 1a

Advanced Diploma in Electrical Engineering Exercises (Page 271/272)

(1)Passive solar design

Q1.What is a active solar system?

Q2.What are micro-climates in Australia?

Slide 2+8

Q3.What is passive solar system design?

Slide 3

Q4.What is thermal mass?

Q5.What are the features of hot humid climate?

Slide 4
Q6.Sketch the building glassing system & how it effects the heating in building?
Slide 5
Q7.Sketch the overview & layout of a building for wind and direct entry
Q8.Sketch direct and indirect sun gain system
Slide 6
Q9.Sketch solar collector.
Slide 7
Q10.Sketch (a0 Air based solar system (b) Water based solar system.
Slide 9+10+11
Q11.What are the factors affecting comfort?
Slide 12+13+14
Q12.Explain psychometric chart.
Slide 15
Q13.Explain (a0 Humidity (b) Relative humidity (c) web bulb temperature (d) Dew point temperature
Slide 16+17
Q14.Sketch the construction of air conditioning system for commercial building
Slide 18+20
272
Q15.Explain the methods for measuring air movement and balancing
Slide 19
Q16.Describe basic building construction with sketches.
---
(2) climate and human comfort
Slide 1
Q17.What is comfort?
Slide 2
Q18.Write the equation to calculate heating degree day.
Q19.Sketch wind and flow diagram of world
Slide 3+4
Q20.Describe the feature of (a0 Hot arid zone (b) Temperate zone
Slide 5+6
Q21.How does heat produced in human’s body?
Slide 7+8
Q22.What change is required to make the comfort when reactive humidity is too high?

Slide 9
Q23.What is shading coefficient?
Slide 10+11
Q24.Sketch incidence & reflected ray diagram.
Slide 11
Q25.Write the equation for environmental temperature & dry resultant temperature.
Slide 12+13
Q26.Write the equation for thermal neutrality.
Slide 14.
Q27.Write the heat gain values for various types of activities.
2.4 Energy evaluation tests are set up in accordance with established test methods and procedures for each particular parameter under scrutiny
Advanced Diploma in Electrical Engineering Exercises (Page 277/278)

Test 2 Question ¾
(6) Ventilation, application of psychrometric chart
Slide 1
Q62.Explain ventilation
Slide 2+3+4+5+6
Q63.Describe air velocity and air volume
Q64.What are the systems of ventilation ? sketch the diagrams.
Slide 7+8
Q65.Sketch air ventilation system for multi storey building.
Slide 9
Q66.Describe the application of psychrometric chart.
Slide 10+11+13+14
Q67.In winter, air at dry bulb temperature of 66°C & 70% RH enters the building through a heating battery. It is heated to dry bulb temperature of 25°C without adding moisture from psychrometric chart. Find
(a) Wet bulb temperature of incoming air
(b) Relative humidity of heated air.
Q68.In Summer, air at dry bulb temperature of 27°C and wet bulb temperature 20°C enters the building through a cooling coil. It is cooled to dry bulb temperature of 19°C
Find
(a) Relative humidity of incoming air

(b) Relative humidity of supply air after cooling.
Q69.The air in a room has a dry bulb temperature of 23°C. Find (a) The relative humidity of air (b) The temperature of walls when condensation occurs.
Q70.Air enters the plant at a dry bulb temperature of 24°C and 80% RH & is required to be cooled to dry bulb temperature of 19°C & 60% RH. Find (a) the temperature of air in washer (b) the reduction in moisture content of supply air.
Slide 16+17+18+19+20
Q71.(a) Calculate heat gain per day from the customers in a 200 m 2 gym, If the gym capacity is 60 customers and the gym is full between 6 am to 8 am and 5 pm to 8:30 pm. At all other times, it is 30% full on average.
(b) Calculate heating contributions from all the appliances in a communal house containing 8 people. The house has one electric hot water system for two bath rooms, 6 bed rooms and one all electric kitchen. One TV, seven music systems, two computers and twenty lights. Assume that the house uses 32 kwh per day and the hot water is 45% of the load. The cooker consumes 20% of the load and 20% of heat generated by cooker is vented outside by the range hood.
(c) In above (b) would it make any difference if the water heater was located outside the building?
(d) What would be the heat gain per month if the cooker in (b) uses bottle gas (Gas is 45MJ/Kg and the house uses 0.5 kg/ day?
(e) The table below lists the power consumption of the appliances used in the house and the hours per day for which they are used. Calculate heat gain from appliances per month.
Appliance Power (watt) Daily usage per appliance (hr)
TV 50 15
Music system 45 3
Computer 100 13
Printer 20 1
Lights 80 2
(7)Thermal mass, centralised air conditioner, cooling load
Slide 1
278
Q72.What are the materials that can be used as thermal mass . Explain the installation method of them.
2.5 Strategies to reduce energy use with compromising occupancy standards are developed from knowledge of energy management and evaluation
Advanced Diploma in Electrical Engineering Exercises (Page 279/280)

Activity

Measure energy usage in the building .

After having applied the energy saving process, compare the energy usage and submit the report.

Test 2 Q 1b

(10) Building service energy management

Slide 1

Q84.Explain building service energy management system.

Slide 2

Q85.Write electricity & oil gas energy unit calculation formula

Slide 3+4

Q86.Compare building load sources

Q87.Express factors influencing room load.

Q88.What are fresh air requirements for various types working spaces.

Slide 5

Q89.Sketch fresh air supply system.

Slide 6

Q90.What are the factors affecting building energy

Slide 7 to 15

Q91.Sketch building water supply system and pipe fitting

Slide 10+11

Q92.Sketch hot water system.

---

(11) Design for climate

Slide 1 to 4

Q93.What are the principles of design for climate?

Slide 5+6

Q94.Explain how to achieve thermal comfort inside building.

280

(12)Air movement

Slide 1

Q95.Explain air movement to get comfort.

Slide 2

Q96.What is evaporative cooling?

Slide 3

Q97.What are the ways of designing the building for Australian climate?

---

(13) Solar effect & wind condition.

Slide 1

Q98.Explain the features of temperate climate & typical home construction method.

Slide 2

Q99.Explain hot arid climate & home construction method.

Slide 3

Q100.Explain hot humid climate & home construction method.

Slide 4

Q101.Sketch diagram for home to access the wind.

Slide 5

Q102.Write the equation to calculate ventilation.

2.6 Unexpected situations are dealt with safely and with the approval of an authorised person

Q4. If the voltage rating of available solar panel can not exactly match the required voltage level, what will you do?

Marking Guide+Question (2 marks)

Connect series/ parallel to get the most appropriate voltage.

Determine appropriate inverter & step up step down transformer.

2.7 Evaluation is carried out without damage to systems, circuits, the surrounding environment or services and using sustainable energy practice

Observation

- Observe students fabrication of solar panel design & connection

Work performance + Practical Instruction Back up

Click HERE to download practicals

http://www.filefactory.com/file/cf88135/n/Practical.zip

- Refer Solar & Renewable Energy Practicals

Location of Evidences (Table 1)

3 Document and report strategies for effective energy reduction in buildings

3.1 OHS work completion risk control measures and procedures are followed

As per 1.1 & 1.2

3.2 Work site is cleaned and made safe in accordance with established procedures

Observation

Students activity in house keeping after the practical task is observed & evaluated.

3.3 Results of energy use evaluation and recommended strategies and their criterion for energy reduction are documented in accordance with established procedures

Advanced Diploma in Electrical Engineering Exercises (Page 280)

After having applied the energy saving process, compare the energy usage and prepare the comparison chart

14) HVAC

Slide 1

Q103.What are the housekeeping check lists for HVAC system?

Slide 2+3

Q104.Explain the energy efficient operation of air-conditioning system.

Slide 4 to 8

Q105.Execute the building survey activities as described in slide 4+5

281

Q106.What are the building survey procedures for domestic and commercial buildings?

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(15) Solar hot water system

Slide 1+2

Q107.Sketch solar hot water system.

Slide 3

Q108.Sketch the construction and connection of solar absorber plates

Slide 4

Q109.Describe (a) Collector surface coating (b) Heat transfer medium (c) Insulation (d) Capacity of storage tank (e) Hot water temperature of solar hot water system.

Slide 5

Q110.Sketch connection of collector and storage tank.

Slide 6

Q111.Sketch the hydraulic circuit of solar water.
Slide 7
Q112.Sketch the electrical circuit for solar water heating system.
Slide 8+9
Q113.Describe installation , orientation & sizing of solar collector system.
Slide 10
Q114.Sketch solar assisted heat pump.
Slide 11
Q115.Explain lighting management for commercial building

3.4 Energy reduction report is forwarded to appropriate persons

Observation

After having applied the energy saving process, compare the energy usage and prepare the comparison chart to be included in the report Presentation & assessment.

The students will need to provide the conclusion on the idea regarding the further energy reduction plan. The conclusion is assessed.

EKAS	Delivery & assessment System
KS01-EK151A Energy efficient building design Evidence shall show an understanding of energy efficient building design to an extent indicated by the following aspects: T1 Climate and thermal comfort encompassing: □ characteristics of the different Australian climatic types. □ use of climatic data in published and electronic forms to extract the quantities relevant to energy efficient design. □ relationship between climate and comfort using bioclimatic or psychrometric charts. □ calculation of heating or cooling degree days or degree hours for various locations. □ calculation of thermal neutrality for a given	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 2 /Question Marking scheme Building Design+Material Science-K041+E047.zip Energy Efficient Building Design K041 Lesson 1-Solar Design.zip http://youtu.be/KF3jT7Wm60I K041 Lesson 2-Basic psychrometric chart.zip http://youtu.be/iVU9d2OrN_c K041 Lesson 3-Total heat resistance.zip

location. T2 Solar geometry and radiation encompassing: ▯ definition of the terms: declination, hour angle, zenith angle, azimuth and altitude angles, the equation of time. ▯ conversion of solar time to local time and vice versa. ▯ position of the sun and the length of shadows with the aid of algorithms, tables, sun charts or computer software. ▯ daily irradiation incident on a wall, window or roof of a given tilt and orientation. ▯ relative summer and winter irradiation of windows facing the cardinal orientations. T3 Heat transfer encompassing: ▯ thermal processes of conduction, convection and radiation apply to the transfer of heat in buildings. ▯ calculation of the summer and winter U-values of building elements using tables and software. ▯ calculation of the infiltration heat transfer in a building. T4 Glazing Systems encompassing: ▯ different types of glazing systems and their characteristics. ▯ different types of shading devices and the window orientations for which they are most appropriate. ▯ solar heat gain for different glazing types and	http://youtu.be/QEC3CFN0C0A K041 Lesson 4-U value Heat conductance calculation.zip http://youtu.be/qJWiSnYVYwI K041 Lesson 5-Glazing+Net Heat gain heat loss.zip http://youtu.be/az4jFnDn4eQ K041 Lesson 6-Shading.zip http://youtu.be/srTWLtaPpgg K041 Lesson 7-Insulation+ Thermal mass.zip http://youtu.be/T8D_KeXhB2Q http://youtu.be/Ws5H152tgEo K041 Lesson 8-Thermal mass insulation.zip http://youtu.be/R5Qv2EFjUVU K041 Lesson 9-Airconditioning load calculation.zip http://youtu.be/KrHJkNwbr0I http://youtu.be/mxP4thaiS88 K041 Lesson 10-Heat gain per day.zip http://youtu.be/X5B99-Q6ddU

angles of incidence • calculation of the average daily irradiation of a window partly shaded by eaves, using computer software. • calculation of the average daily heat gain through a window partly shaded by eaves. T5 Insulation encompassing: • different types of insulation and where they are used. • how different types of insulation are installed in roofs, walls and floors. • determination of the minimum R-values of roof insulation for different locations using Australian Standard AS2627 or similar standards. T6 Thermal mass encompassing: • advantages and disadvantages of using substantial thermal mass in different climate types and for different heating and cooling regimes. • where thermal mass can be located in a building. • explain what is meant by the following terms: time lag, decrement factor, admittance, response factor. T7 Comfort control strategies encompassing: • interpretation of the usefulness of a design strategy with the aid of a psychrometric chart showing control	K041 Lesson 11-Ventilation.zip http://youtu.be/LdCEptDVMlY K041 Lesson 12-Building heating load http://youtu.be/VDHl1YbcX3c http://youtu.be/FH1bPDCuLD0 K041 Lesson 13-Design Assessment Tools K041 Lesson 14-Design for Australian climate.zip http://youtu.be/6Vhv5H4Wfps K041 Lesson 15-Domestic solar hot water system.zip http://youtu.be/JCgxvzX5jHY http://youtu.be/j5bfWGOS_zA K041 Lesson 16-Energy efficiency+Lighting.zip http://youtu.be/CVvXJj28pcg K041 Lesson 17-Illumination+Smoke alarm.zip http://youtu.be/piMwahVLYhw http://youtu.be/JBvzyR-_GzA

potential zones for a particular location. • selection of the most useful comfort control strategies for Australian climatic regions. T8 Energy efficiency in buildings encompassing: • determination of the direction of the following: both true and magnetic, north winter and summer sunrise, winter and summer sunset. • solar access in summer and winter to various possible house locations on a site and room locations within the house. • how vegetation can be used to both funnel and deflect wind. • using cross ventilation as a cooling strategy. T9 Thermal performance of a building encompassing: • heating requirements of a building using the heating degree day or hour method. • dynamic performance predicted by a computer simulation program such as NatHERS or BERS. T10 Integration of active solar systems encompassing: • active solar system types available which can provide hot water, space heating and cooling. • the best location on the roof, and the optimum tilt and orientation of the collector panels. • function of the main components of an air or	K041_Lesson_18-Water_supply.zip http://youtu.be/-A96eIUfsNU K041_Lesson_19-Ventilation+Lighting_control.zip http://youtu.be/CO0ClnAFT6A K041_Lesson_20-Electrical_system_design.zip http://youtu.be/KX7E_Nc7_54 K041_Lesson_21-Building_materials.zip http://youtu.be/Gi77wNzXEj4 http://youtu.be/ZkgOHP0RESs http://youtu.be/C6sxFVofvkE http://youtu.be/8BcUJ7BDKlI http://youtu.be/ap0iMZ_Z9Qs

water-based solar space heating system. ▯ schematic of the fluid circuit of an air or water- based space heating system. ▯ main solar cooling system types. T11 Energy rating schemes encompassing: ▯ differences in approach used by house energy rating schemes in Australia. ▯ energy performance of a number of houses using a computer simulation program such as NatHERS or BERS. ▯ other methods to reduce energy consumption within and outside a building including appliance efficiency, human behaviour changes, building management strategies and transportation minimisation. ▯ additional cost of energy efficiency measures and cost savings using life cycle cost or simple pay back methods according to Aust. Standard AS3595 and AS4536. T12 Sustainable and safe building materials encompassing: ▯ common building materials and their embodied energy content. ▯ environmental impact of the production of various building materials. ▯ problems associated with the use or disposal of building	

materials.	

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 2 /Question Marking scheme Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 2/ Assessment Cover Sheet Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 2/ Assessment Feedback Sheet
Students' work in own record	Summative Assessment- Formal Tests	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 2 /Student Work
	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/K151 Assessment 2 /Student Work Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 2016 Attendance Records+Record Book
Marking Guide to be presented for audit		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents
Students' work to be presented for		In attached USB/DVD/CD Attached Some documents in team share UEE11-1.5 Printed documents

audit	

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1		X	
1.2		X	
1.3		X	X
1.4	X		
1.5		X	X
2.1		X	
2.2		X	X
2.3		X	X
2.4		X	X
2.5	X	X	X
2.6	X		
2.7	X		
3.1	X	X	
3.2	X		
3.3		X	X
3.4		X	X
EKAS Assessment		X	X

Energy Efficiency References

http://electricaldiploma2013.zoomshare.com/files/energencyefficiencereference.htm

Advanced Diploma in Electrical Engineering Exercises

Click HERE

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with IS67 assessment Mapping.pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	**UETTDRIS67A Solve problems in energy supply network equipment and systems**		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1 Prepare to solve problems in energy supply network nequipment	1.1	OHS procedures for a given work area are identified, obtained and understood	Q1,2,3 of IS67 assessment Mapping.pdf Page 2		
	1.2	OHS risk control measures and procedures in preparation for the work are followed	Q4,5,6,7 of IS67 assessment Mapping.pdf Page 2		
	1.3	The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)	Q8 of IS67 assessment Mapping.pdf Page 2		
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.	Q9 to 12 of IS67 assessment Mapping.pdf Page 3		
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.			Advanced Diploma in Electrical Engineering Exercises Page 119) Q8 to 11
	1.6	Tools, equipment and testing devices needed to take measurements are obtained in accordance with established procedures and checked for correct operation and safety.			Advanced Diploma in Electrical Engineering Exercises Page 119) Q18 to 23

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
2.Solve problems in energy supply network equipment.	2.1	OHS risk control measures and procedures for carrying out the work are followed.	As per 1 .1, 1.2, 1.3		
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.			Advanced Diploma in Electrical Engineering Exercises Page 119) Q28 to 30
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures	As per 1.3		
	2.4	Safety hazards resulting from the reports and risk control measures devised and implemented in consultation with appropriate personnel.	As per 1.3		
	2.5	Problem solving is approached methodically drawing on knowledge of energy network equipment using measured and calculated values of circuit/apparatus parameters.	Electrical Diastribution Test 1 Q 1 to 13	Practical EP1 to 8+ Ep19 to 23	
	2.12	Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices	Electrical Diastribution Test 1 Q 1 to 5	Practical EP1 to 8+ Ep19 to 23	
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage		Practical EP1 to 8+ Ep19 to 23	Advanced Diploma in Electrical Engineering Exercises Page 119) Q31 to 32

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
	2.7	Circuits/components are rechecked and their operational status is confirmed.			Advanced Diploma in Electrical Engineering Exercises Page 119) Q40 to 42
	2.8	Materials/replacement parts required to solve problems are sourced and obtained in accordance with established procedures.		Practical EP1 to 8+ Ep19 to 23	Advanced Diploma in Electrical Engineering Exercises Page 119) Q18 to 21
	2.9	Effectiveness of the repair is tested in accordance with established procedures.		Practical EP1 to 8+ Ep19 to 23	As above
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.			As above
	2.11	Unexpected situations are dealt with safely and with the approval of an authorised person.	As Per 1.3		
	2.12	Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable	As Per 2.5		
3.Completion and report for problem solving in energy supply network equipment	3.1	OHS work completion risk control measures and procedures are followed.	As Per 1.3		
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.		Transmission Line Design Project	
	3.3	Maintenance work activities are documented in accordance with established procedures.		Transmission Line Design Project	

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Receiving end voltage comparison between short/ medium and long transmission lines		EP1	
Long transmission line PI equivalent circuit		EP2	
Long transmission line T equivalent circuit		EP3	
Transmission line efficiency/ Transformer effect on line efficiency		EP4	
Reactive power and power factor improvement		EP5	
PF effect on line current		EP6	
Corona Video		EP7	
Phase sequence measurement		EP8	
Underground cable capacitance test		EP19	
High tension line design		EP20	
Line insulator test & capacitance grading		EP21	
Voltage profile chart of distribution system		EP22	
Load centre-Power loss comparison		EP23	

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 Generation	Test 1 Q 1,5 Test 3 Q 1,2,3		
T2 Transmission	Test 1 Q 2,3,4 Test 3 Q 4,5,6		
T3 Distribution	Test 1 Q 3,6,7,9 Test 3 Q 8,9,10		

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T7 Voltage problems			Advanced Diploma in Electrical Engineering Exercises Page 119) Q333, 34
T9 Control of OLTC encompassing			Advanced Diploma in Electrical Engineering Exercises Page 123) Q 1 to 4
T10 Power distribution system faults			Advanced Diploma in Electrical Engineering Exercises Page 199) Q 21 to Q25
T11 Voltage surges in a power distribution system			Advanced Diploma in Electrical Engineering Exercises Page 199) Q 13 to Q 17
T12 Metering and metered quantities		EP10	
T13 Energy and demand meters encompassing:			Online Research Assignment
T5 Overhead and underground systems	Test 2 Q 1 to 5		
T6 Power distribution system electrical characteristics	Test 1 Q 3,4,10,13 Test 3 Q 1,2		
T8 Voltage regulation	Test 3 Q 11		

Add rows to the following table as required

Assessment Conditions	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
<Insert Assessment conditions >	**Insert question number/task skill number/evidence**	**Insert question number/task skill number/evidence**	**Insert question number/task skill number/evidence**

	from assessment tool that address the specific, assessment conditions	from assessment tool that address the specific, assessment conditions	from assessment tool that address the specific, assessment conditions
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments Records relating to electrical engineering resources	Test 1,2,3	Practical EP1 to 8+ Ep19 to 23	Design Assignment & Theory Assignments

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UETTDRIS67A Solve problems in energy supply network equipment and systems

ONLINE RESOURCES ARE SUPPORTED THE STUDENTS TO ACQUIRE THE COMPETENCIES

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

1 Prepare to solve problems in energy supply network nequipment

1.1 OHS procedures for a given work area are identified, obtained and understood

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q15+16

www.electricaldiploma2013.webs.com Then access Click **HERE** to download the Exercises

http://www.mongroupsydney1.com/Advanced_Diploma_in_Electrical_Engineering_Exercises_EE011.pdf

Relevant Instruction Lessons

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

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Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

Q1.Describe the risks and dangers in power station and outline the recommended safety
Q2.equipments and emergency procedures.
Q3.Outline the process of maintenance work in substation.

1.2 OHS risk control measures and procedures in preparation for the work are followed

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q17+18 Page 4 Q21+22
Q4. Write down the check list to perform the tasks in substation.
Q5. Write down the safety procedures and methods to assess the risk and to reduce the risk.
Q6..Write down the code of practice for working near exposed main and apparatus.
Q7.Which precautions are to be emphasized when working in substation?

1.3 The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)

Q8. Write down the risk reduction procedures in maintenance work to discuss with work manager. (Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)

1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.

Answer the following questions to seek the advice from work supervisor in the following aspects.
Q9. What are the risks?
Q10.How are the risks classified?
Q11.How can the risk be evaluated?
Q12.How will you manage the risk? Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q8 to 11)

1.5 Sources of materials that may be required for the work are established in accordance with established procedures.

Submit the following assignment questions
Ref-Advanced Diploma in Electrical Engineering Exercises Page 119)
(6) Pole & line installation technique
Slide 1
Q8.Describe pole and line installation techniques.
Q9.Sketch line profile diagram.
Slide 2
Q10.What are the requirement for line planning?
Q11.What are the scales to be utilized for preparing line design drawing.

1.6 Tools, equipment and testing devices needed to take measurements are obtained in accordance with established procedures and checked for correct operation and safety.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 120)

Slide 5

Q18.Write down the methods and requirement for staying of pole and support.

Slide 6

Q19.Sketch the diagram for essential components of staying pole.

Slide 7

Q20.What are the requirement of conductor size and separation of conductors?

Slide 8

Q21.Show the table for span & spacing relationship

Slide 9

Q22.Do the review question exercises.

Slide 10

Q23.What are the methods to reduce the stress in UG cable?

Line survey & line design

Study slides 1 to 14 and perform the given line design.

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 2 /Question Marking scheme Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 2/ Assessment Cover Sheet Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 2/

		Assessment Feedback Sheet
Students' work in own record	Summative Assessment- Formal Tests	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 2 /Student Work
	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 2 / Student Work Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 2016 Attendance Records+Record Book

2 Solve problems in energy supply network equipment.

2.1OHS risk control measures and procedures for carrying out the work are followed.

As per 1.1 to 1.3

2.2The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 121)

(9) UG cable capacitances, testing , connection

Slide 1+2

Q28.Sketch the UG cable & indicate capacitance . Express the equation to calculate capacitance.

Slide 3+4

Q29.A single core 66KV cable has a conductor diameter of 2.5 cm and sheath inside diameter 6 cm. Find the maximum stress if two inter-sheaths are used. .Find the best position. The maximum stress & the voltage on inter sheaths.

Slide 5

Q30.In testing of UG cable , conductor 2 & 3 are connected . By measurement of capacitance between conductor 1 and 2-3 combination is 7 µF. When all conductors are connected, the measured capacitance is 5 µF. Calculate the capacitance between conductors & the capacitance between conductor & sheath

2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures

As per 1.3

2.4 Safety hazards resulting from the reports and risk control measures devised and implemented in consultation with appropriate personnel.

As per 1.3

2.5 Problem solving is approached methodically drawing on knowledge of energy network equipment using measured and calculated values of circuit/apparatus parameters.

2.12 Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

	Assessment Method	Question
EKAS Topics T1 Generation encompassing: □ primary energy sources □ power stations □ power station output □ acts and legislation relating to generation □ renewable energy sources and techniques T2 Transmission encompassing: □ system requirements □ principal components of a power system □ voltage levels □ grid systems □ acts/legislation relating to transmission □ future trends T3 Distribution encompassing: □ high voltage distribution systems □ medium/low voltage distribution systems □ radial feeders □ parallel feeders □ ring main feeders □ acts/legislation relating to distribution T4 Substations encompassing: □ purpose □ location □ layout T7 Voltage problems in a power distribution system encompassing:	Multiple choice/short answer questions	**<u>Electrical Distribution (Test 1)</u>** (20 marks) 1. Name the factors that are used in the selection for overhead line conductors 2 marks 2.Name six commonly used materials for overhead line 2 marks 3.Name the three factors that determine conductor current rating 2 marks 4. What are the factors that determine the maximum conductor temperature? 2 marks 5.Sketch and explain the advantages and disadvantages of the followings Radial feeder, ring feeder, parallel feeder 2 marks 6.A crossarm is listed as 2.7P/16/100x100. Describe the meaning of each term in the list. 1 mark 7.Describe the three common types of insulators used in the distribution system 2 marks 8.Describe the use of arcing horns. 1 mark

low voltage unbalanced voltages voltage rises T8 Voltage regulation encompassing: autotransformers with OLTC transformers with OLTC static capacitors load control T9 Control of OLTC encompassing: regulation relays control circuits line drop compensation T10 Power distribution system faults encompassing: type/classification of fault typical causes/effects of faults three-phase symmetrical fault levels fault level limitation T11 Voltage surges in a power distribution system encompassing: lightning surges switching surges typical surge levels surge impedance, typical values significance of the system surge impedance. T12 Metering and metered quantities encompassing: purpose energy maximum demand accuracy classes for metering systems T13 Energy and demand meters encompassing:		9.Brifely explain the following pin insulator designations APL33/920 SLP 11/180 2 marks 10.The conductor to be erected over a 160m span has an equivalent weight of 4N/m diameter of 12mm and ultimate tensile strength of 33KN Determine the sag which must be provided on erection if it is desired to allow for wind loading of 500pa and safety factor of 3.5 2 marks 12.Illustrate by mean of a sketch, the method of terminating the line giving dimensions where possible. 1 mark 13.Percentage of the ultimate strength of various parts of overhead line Steel ---% Wood_____% Stay wire/Insulator_____% 1 marks

T5 Overhead and underground systems encompassing: REQUIRED SKILLS AND KNOWLEDGE applications planning installation T6 Power distribution system electrical characteristics encompassing: transmission and distribution systems inductance, capacitance and resistance T8 Voltage regulation encompassing: autotransformers with OLTC transformers with OLTC static capacitors load control	Multiple choice questions Short answer questions Practical testing of cables	**Electrical Distribution (Test 2)** **Total marks- 20** (1) What are the factors that determine the current rating of a cable? 3 marks (2) How will you reduce the stress on electrical cable? 3 marks (3) A single core 66KV cable has a conductor diameter of 2 cm and a sheath of inside diameter 5.3cm. Find the maximum stresses . If two inter sheaths are used. Find the best positions, the maximum stresses and the voltage on inter sheath. 5 marks (4) In testing of a UG cable, conductor 2 & 3 are connected, by measurement of capacitance between conductor 1 and 2-3 combination it is 6 micro farad. When all conductors are connected, the measured capacitance is 4 micro farad Calculate the capacitance between conductors and the capacitance between conductor and sheath 5 marks (5) Explain the methods applied to find the fault in UG cable

		4 marks
T1 Generation encompassing: **primary energy sources** **power stations** **power station output** **acts and legislation relating to generation** **renewable energy sources and techniques** **T2 Transmission encompassing:** **system requirements** **principal components of a power system** **voltage levels** **grid systems** **acts/legislation relating to transmission** **future trends** **T3 Distribution encompassing:** **high voltage distribution systems** **medium/low voltage distribution systems** **radial feeders** **parallel feeders** **ring main feeders** **acts/legislation relating to distribution**	Short answer questions Multiple choice questions Voltage profile design assignment	**Electrical Distribution (Test 3)** **Total marks - 40** Question (1) Draw a block diagram of a power system from generation to utilization and on it show typical voltages. 2 marks Question (2) Sketch a radial feeder arrangement and state it's advantages and disadvantages. 2 marks Question (3) Explain the term joint use agreement as applied to poles in a distribution system. 2 marks Question (4) Outline a maintenance programme suitable to use by a distribution authority to ensure safety and reliability of poles used on it's system. 3 marks Question (5) Where are pole stays likely to be used on an overhead line? List the essential components for the staying of a pole. 3 marks Question (6)

		An underground cable is designed: 11KV 500 AL3 PHL SWZ. Give a full description of cable make up. 2 marks Question (7) A 3 phase load of 200KVA 50Hz is to have its power factor improved from 0.75 to 0.9. Calculate the size of capacitor bank required if the supply voltage is 415V. Sketch the connection. 3 marks Question (8) A transformer supplies a group of four feeders which have individual maximum demands of 2.5, 2.4, 4.3 and 1.6 MVA. If the diversity factor of the system is 1.82 determine the maximum demand on the transformer. 3 marks Question (9) The conductor to be erected over a 160 m span has an equivalent weight of 4 N/m, diameter of 12 mm and ultimate tensile strength of 33KN. Determine the sag which must be provided on erection if it is desired to allow for wind loading of 500 Pa and safety 3.5. 4 marks Question (10) A 3 phase , 11kV overhead rural line is to be erected between points A and B. The route of the wooden pole line is straight and the soil resistance to movement is good. Standard pin insulators on single wooden crossarms form part of the line

insulation.

(a) Nominate the ground clearance you would recommend and indicate details relating to this decision

(b) The maximum conductor design sag has been set at 1.0m. Indicate a suitable pole planting depth and determine the total length of pole.

(c) If the termination poles are located at A and B, what would be the most economical number of poles for the power line of 3.0 km in length? Details of the conductor to be used are shown below:

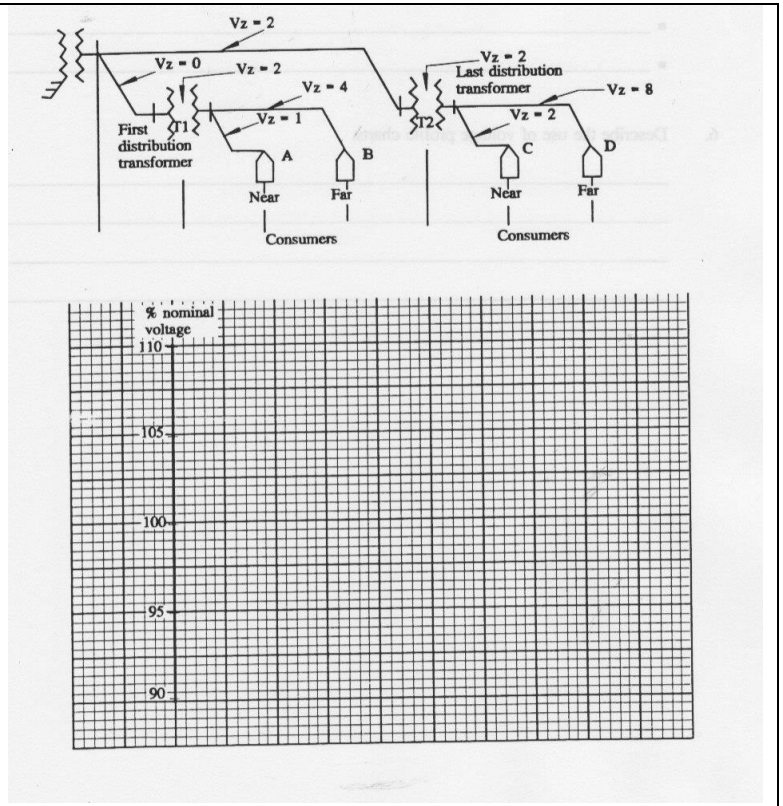
Mass per 100 m	=	43 kg
Wind loading	=	750 Pa
Equivalent diameter	=	16 mm
Design tension	=	6 kN
Ruling average sag	=	1.0 m

(d) Nominate the three factors which determines the current rating of cables.

8 marks

Question (11)

For the simplified single line diagram below, plot the voltage profile for heavy load period. The voltage at point A is 110% nominal. The Vz values indicated on the diagram
Show the percent impedance voltage drop per unit of consumer heavy current.



6 marks

Question (12)

State the three general methods of voltage control.

2 marks

2.6 Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage

Ref-Advanced Diploma in Electrical Engineering Exercises Page 121)

(10) Decision strength and fault in UG cable (You need to make the dismantling to find out the fault)

Slide 1+2+3

Q31.Conductor insulation thickness = 0.52 cm. , dielectric constant = 4, Belt thickness = 0.45 cm,

Conductor diameter = 1.7 cm. Calculate the capacitance to neutral for 1.5Km long cable.

Slide 4

Q32.Explain UG cable fault finding methods.

2.7 Circuits/components are rechecked and their operational status is confirmed.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 122)

To determine the operational status, voltage status need to be confirmed. The following are the questions for that purpose

Q40.Describe the causes and effects of voltage regulation.

Slide 5

Q41.State three general methods of voltage control.

Q42.List five voltage control devices in distribution system.

2.8 Materials/replacement parts required to solve problems are sourced and obtained in accordance with established procedures.

2.9 Effectiveness of the repair is tested in accordance with established procedures.

2.10 Apparatus is reassembled, finally tested and prepared for return to service.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 120)

To replace the poles, the following questions assist the candidates to acquire the necessary parts

Slide 5

Q18.Write down the methods and requirement for staying of pole and support.

Slide 6

Q19.Sketch the diagram for essential components of staying pole.

Slide 7

Q20.What are the requirement of conductor size and separation of conductors?

Slide 8

Q21.Show the table for span & spacing relationship

2.11 Unexpected situations are dealt with safely and with the approval of an authorised person.

As per 1.3

2.12 Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

As per 2.5

Location of Evidences (Table 1)

3.Completion and report for problem solving in energy supply network equipment

3.1 OHS work completion risk control measures and procedures are followed.

As per 1.3

3.2 Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.

3.3 Maintenance work activities are documented in accordance with established procedures.

POWER SYSTEM PRACTICAL LINE DESIGN PROJECT

7	Short answer question Practical survey assessment Overhead line design assignment	OH Line Design Assignment 20% **TRANSMISSION LINE DESIGN PROJECT** • *This project will have to be completed in Week 9. But the components of the project can be done concurrently with class lessons. You also need to think about how to do the following tasks whenever you complete the lectures in the respective week shown in brackets beside the following tasks. You also need to refer the respective notes in CD as indicated in underlined sentences.* • *You need to use ruler to do scaled drawing for line route.* (1) Draw Line route to supply the proposed factory location from 3 Phase 11 KV line. Put on map (Week 5) (2) Draw side view of the route that you select for power line route. Show ground levels. (Week 4) (3) Plan profile drawing for the power line **2.5 State pole and line installation techniques in CD** refer profile drawing Fig 11.8. (Day 4) (4) Determine the appropriate size of pole. Mention appropriate length of cross arm, height, diameter **(Refer my e-mail attachment- Page 44 –(***I will send you***) & Topic 2.2 Outline relevant factors related to installation, maintenance, cross arms, stays, pole types and choice of conductors sizes for commonly used configuration in CD**. You will see clearance in Table 1-Open supply line. You need to convert foot to metre.1 metre= 3.3 Feet (Week 2, 3)

		(5) Select appropriate insulator and cross arm**(Disc insulator EA2/D EA3/D etc)** (Week 2) (6) Select the size of conductor based on 2MVA 33KV 3 Phase.Refer AS 3008 (Refer my e-mail attachment: AS3008 Pages) OR **2.3 Determine mechanical limitations and physical dimensions of lines in CD** (7)Calculate sag. **(Use formula in Review Question (1) Question 10/11)** (Week 2) (8)Draw cross arm, pole, insulator. Refer **2.1. Identify relevant components use in over head line** **design in CD.** Week (3) (9) Attach vibration damper, guy wire , line guard as necessary **Review Question (1) Number 14.** (10) Show footing **Review Question (1) Number 15.** (Week 2) (11)Install cross arm to pole, insulator Refer **2.5 State pole and line installation techniques (Part** **2,3,4) in CD.** (12)Prepare list of materials. Cable, insulator, etc that you use. (Week 9) (13) Sketch line diagram----- Containing-Route and pole diagram with dimension (Week 9) NOTE==== MAIN SUPPLY 33 KV is located at

		Shopping Centre from where , you take the supply

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Refer Power System Practicals

Part 1: Operational Study

Lab No	Name of Practical	Equipments	Assessment
	Group 1 Power & Line		
EP1	Receiving end voltage comparison between short/ medium and long transmission lines	distribution system types	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP2	Long transmission line PI equivalent circuit	overhead systems	As above
EP3	Long transmission line T equivalent circuit	distribution system types	As above
EP4	Transmission line efficiency/ Transformer effect on line efficiency	energy metering • demand meters	As above
EP5	Reactive power and power factor improvement	energy metering • demand meters	As above
EP6	PF effect on line current	energy metering • demand meters	As above
EP7	Corona Video	• surge protection	Report presentation, conclusion

EP8	Phase sequence measurement		Competency assessment
	GROUP 2- Protection equipments		
EP9	Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply)	protection equipment and systems	Competency assessment
EP10	Current transformer & potential transformer connection & ratio test	current transformers • potential transformers	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP11	Over current relay characteristics	protection equipment and systems • over-current protection	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP12	Electronic relay test	conventional relays • electronic relays	As above
EP13	Study of various protective relays used in industry through trade references	• earth fault protection • differential protection busbar protection • surge protection • conventional relays	Research, report presentation
	Group 3- Supply System		
EP19	Underground cable capacitance test	underground systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP20	High tension line design	• overhead systems	Design project
EP21	Line insulator test & capacitance grading	• overhead	Circuit interpretation, connection, data collection, calculation, graph

		systems	sketch, report presentation, conclusion
EP22	Voltage profile chart of distribution system	• voltage regulation equipment • on load tap changers	As above
EP23	Load centre-Power loss comparison	• distributor equipment	As above
EP30	Transformer polarity test	• distributor equipment	As above
EP42	Maximum power transfer theorem with power circuit	• load control	As above
EP43	Load flow study	• load control	As above
EP45	Trade reference study, switch board, busbar, insulator, circuit breakers	reclosers / sectionalisers.	As above

General faults including: open-circuit; short-circuit; incorrect connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure for the equipments in the range

(2)**Explore some of the faults in power system/ energy supply that can be rectified only by utilizing para-professional knowledge background and how the arranged simulated practical can provide the hand on experience and work performance for the students and how it is different from the performance only based on trade level activities.**

In range of performance, it outlines the real equipments used in the industry. There will be the arguments that the setting of practical in lab room only includes rheostat, resistor, varic, capacitor etc. How it meets the outlined competencies?
To exactly find out and rectify the faults in energy supply system , the tasks and complexity level more than the trade level- (check the continuity, check the connection, visual inspection, testing and measurement)will be included.
The following is the various power system faults which I draw out from my power engineer work records that the technical knowledge higher than trade level is required to successfully rectify the fault and determine the appropriate solutions. In the table, I summarize how the fault is ,

caused, background theory, how the person who knows the theory will do, how the person who does not know the theory will do and how my simulated practical / and practical related background theory will assist to develop the fault finding skill.

Typical fault	Cause	Related Theory	How the person who does not know the theory will do	How the person who knows theory will do	Name of simulated practical	How to develop the skill
(1)In reticulation system, there is abnormally different in voltages	Abnormal resistance. Wrong cable selection. Abnormal circuit configuration	Voltage profile chart.	May give he other idea to change the load	Measure voltage, sketch the voltage profile chart. Then identify the portion of the circuit.	EP 23 Voltage profile chart	Develop the analytical skills to identify the fault point
(2)Line conductor slips from the pin insulator	Line deviation is too high, combination of wind, conductor tension will take away the conductor from pin insulator	Line deviation angle calculation	Will reinstall the line. After some period, he same thing will happen again	Will examine line deviation angle. Tension, wind force. Will rearrange the line or provide shackle insulator	Theory instruction. Line deviation	Develop the problem solving skill on line construction.
(3)Conductor sag too low. Hit by traffic and then broken	Sag calculation. Wrong tension, safety factor, weight	Sag/ line design	Pull up the cable. After some time, it will fall again	Will examine the related parameters and find the way	EP 20 High Tension Line Design	Develop the skill on line design and to know the technical factors for sag.
(4)Discharge current flows out from underground insulator and cause the injury	UG cable capacitance. Charging current	UG Cable capacitance test	Will think about current flow, leakage etc.	Will examine the UG cable capacitance and produce the procedure for discharging	EP 19 Underground cable capacitance test	Develop the skill in UG cable testing focus on capacitance and estimate the amount of charging current
(5)Line pole broken without natural disaster	In appropriate pole strength	Pole mechanical design	Will erect the pole. Some time after, broken gain	Will examine he tension, wind force, conductor weight, then will calculate the pole strength and select appropriate diameter of pole and appropriate pole material	Pole mechanical design lesson + EP 20 High tension line design	Develop the skill on line design and to know the technical factors for pole.

2 Complete and report fault diagnosis and rectification activities.

3.1 OHS work completion risk control measures and procedures are followed.

3.2 Work site is made safe in accordance with established safety procedures.

As per 1.3

3.3 Rectification of faults is documented in accordance with established procedures.

3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Fault	Reason	Related theory	The person who does not know the theory will do	The person who knows the theory will do	Related Practical	Development of skill
(6)There are too much power loss. Line efficiency is poor	If all connected loads are all right, wrong location of power station/ load centre	Load centre study	Will not take account on load centre	Will take account on load centre	EP23 Load centre power loss comparison	How the location of supply source affect line losses/ efficiency and % voltage regulation
(7)Problem with UG cable joint	Wrong method in UG cable joining	UG cable joining methods. Theory study			UG cable joining method in my prepared 7762 AA Electrical Distribution textbook	UG cable joining methods. Theory PLUS photographs
(8)Generator got motor action. Reverse power relay cuts off	Out of synchronism. Up to 180 degree out of phase	Synchronizing	Will neglect synchronism. Just run and switch on	Will focus on synchronizing process. Avoid reverse power relay operation	Synchronizing	Synchronism, generator parallel operation requirement practical knowledge development.
(9)Generator vibration/ hunting	Stability concept	System stability	Do not care on machine hunting. Will continue to run . As consequence, face the short life of bearing/ shaft	Will take care on transient and steady state system stability and prevent the hunting	Moment of inertia/ machine stability	Moment of inertia/ machine stability practical knowledge development.
(10)Relay operates on fault. But the system loss the synchronism	System stability/ critical fault clearing angle aspect.	System stability/ critical fault clearing angle	Do not care on the relay setting to provide both fault protection and maintain the system stability. Re-synchronize the generators when ever the relay operates	Will set the proper relay setting to maintain the stability	Critical fault clearing angle. Equal area criteria	Critical fault clearing angle. Equal area criteria practical knowledge development.

(11) Line reactive power too much. The equipment capacity is unnecessarily increased	Problem related to load flow	Load flow study	Will not take account on load flow concept.	Take account on load flow and optimize the loading	EP 42 Maximum power transfer theorem EP43 Load flow study	Develop the load flow concept and practical optimizing skill
(12)There is nothing wrong with the line but the transformer placed near the switch heat up and cooked	Switching surge	Switching voltage surge	Just replace the transformer. After some time, the same problem will be faced	Take account on switching voltage surge and plan tom install the surge diverter.	Switching voltage surge	Switching voltage surge practical knowledge development.
(13)Light radiated from the power line. Too much power loss and high interference to telecom line	Corona	Corona study	Will consider the ACT OF GOD	Will find the way to reduce corona such as application of hollow conductor to increase diameter of conductor to raise the critical voltage level	EP 7 Corona video	How corona occurs and find the way to prevent .
(14) Control telecommunication for power line down, no relay operates	Application of telecommunication system in power system operation	Application of telecommunication system in power system operation 7762AG Power System Operation	Will not be aware of the role of telecommunication system	Will check the function of telecom equipment for power system control and protection and perform the preventive maintenance	Application of telecommunication system in power system operation	Web based control/ IP based control and telecomm: concepts practical knowledge development.
(15)Too much flickering of lamps	Harmonics	Harmonics in power system	Will not know what happens	Will check the harmonics source/ increase the size of neutral wire to allow the harmonics current flows	Harmonic source scope observation	Development of identifying the harmonics
(16)Lightning strike	Lightning arrester	Lightning arrester	Will reinstall LA. But not sure it will be safe or not.	Will check the coverage provided by lightning arrester	Lightning arrester study	Lightning arrester practical knowledge development.
(17)Earth fault/ earth leakage can not be protected	Grounding in power system	Grounding in power system 7762AE Power System Protection	--	Will measure the ground resistance, will implement the additional ground connections	Power system grounding study	Power system grounding practical knowledge development.
(18)Occurance of over current	Over current protection	Over current relay 7762AE Power System Protection	Will not exactly know how to set/ adjust the over current relay	Will set/ adjust the over current relay	EP11 Over current relay characteristics	Practical skill development in over current relay
(19)Earth leakage fault	Earth leakage protection	Earth leakage protection 7762AE Power System	Will not exactly know how to set/ adjust the earth leakage relay	Will set/ adjust the earth leakage relay/ CT arrangement	CT arrangement for earth leakage fault & fault in protected zone	Practical skill development in earth leakage fault

		Protection				protection
(20)Transformer protection	Differential relay	Differential relay	Will not exactly know how to set/ adjust the differential relay	Will set/ adjust the differential relay	CT arrangement for fault in protected zone	Practical skill development in differential protection
(21)Line is protected by differential/ over current relay. But it is not effective when the load are fed from some part of the line	Distance relay	Distance relay	Will not exactly determine the reason why and how to change the protection system	Will change the protection system and will calculate earth fault impedance	Earth fault calculation	Problem solving skill development in earth fault calculation
(22)Fault happens but the relay can not provide the effective protection	CT/ PT ratio for relay	Relay protection scheme	Will not exactly determine the reason why and how to change the protection system	Will adjust CT PT ratio at the simulated fault situation and will adjust the relay setting appropriately	EP9 Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply) EP10 Current transformer & potential transformer connection & ratio test	Practical skill development in CT PT ratio adjustment
(23) I accidently open the CT secondary and it got explosion	Current transformer	Current transformer		Will make sure not to open circuit the CT secondary	EP10 Current transformer & potential transformer connection & ratio test	Develop the skill on CT/ PT connection & applications.
(24) we use old type gravity relay, it does not provide the effective protection	Restrainting system of relay	Relay types & characteristics		Will make sure to correctly arrange the relay position	EP13 Study of various protective relays used in industry through	Knowledge development on various protective relays used in

					trade references	industry through trade references
(25) Relay operates at wrong current	Operation/ setting of relay	Relay types & characteristics	Trial error approach will be used	Will make sure to correctly arrange the relay setting	EP11 Over current relay characteristics	Practical skill development in over current relay
(26)In power transformer protection. Transformer is Star/Delta connection. All relay settings are correct. But relay wrongly operates. I checked all continuity. Every thing all right	Transformer Star Delta & relay star/delta matching	Star delta vector diagram. Transformer star side –Relay delta & transformer delta—Relay star	Will not know what happens and how to rectify the fault	Will check the connection and will consider the vector difference causes the wrong operation	EP10-CT & PT connection/ ratio check	Practical skill development in CT/PT Connection
(27)Regulator is set to meet the system voltage condition. But later time, it is blown out	Voltage ratio/ regulator setting	Voltage regulator	Will emphasize in solving the problem for a short moment. Will not consider the long term impact	Will consider whether the setting to upgrade the voltage will impact on future system voltage change	EP22 Voltage profile chart of distribution system	The skill training to develop the judgment of voltage level and future impact
(28)Fault spread from one busbar to another busbar	Busbar arrangement/ sectionalization	Busbar arrangement	Will assemble he busbar to install the equipment, will not consider how the arrangement can contribute the spread of fault	Will consider the way to insert section circuit breakers	Busbar layout/ arrangement study	Busbar arrangement sketch/ plan practice development
(29)Equipment suffers over voltage and blown out after the capacitor value is changed for PF improvement	Inappropriate capacitor setting. Cause of overvoltage. Vector diagram	PF improvement/ Capacitive reactance effect on load	Will only see the way to improvement the PF. Will not know the consequences	Will posses the knowledge of capacitor impact on load voltage and will take account on optimal setting of capacitor value	EP5-capactance effect on line EP6-PF Improvement	PF improvement method is judgment with capacitor effect causes over voltage. This skill is trained.
(30)Directional relay does not work to protect the reverse power flow	Directional relay operation	Study on directional relay.		Wrong connection to direction coil will be identified	EP 13 Protective relays used in industry	Guide to acquire the relevant technical knowledge
(31)Voltage flashing over capacitor string	Capacitor string	Study on capacitor string	Will change the capacitor string	Will provide the preventive protection such as arcing horns OR take account on line capacitor grading	EP21 Line insulator capacitance test	Develop the skill to measure line capacitor value . Capacitance grading.

(32)Circuit Breaker itself is blown out	Circuit Breaker capacity	Study on capacity of circuit breaker	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault	EP13 Relay & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(33)CB too hot and meltdown	CB capacity/ Arc development	Study on capacity of circuit breaker/electric arc	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault Will consider the arc extinguishing methods	EP13 Rely & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(34)Need to expand the line in emergency. I am only in-charge	Line design	Line design project	Will not know how to design a line	Will utilize references/ methods to design and construct the line	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(35)HV current flows into LV line	Separation between HV & LV line	Rules & regulations related to line	Will not know the regulation	Will apply the regulation in real wok	7762AA Line pole/ cross arm design and conductor arrangement	Line electrical & mechanical design practice development
(36) Line wire fracture	Sag calculation	Sag calculation/ minimum cable size	Reinstall the line wire. Like part to like part replacement is applied, will use the same size of cable. After sometime, line will break gain	Will consider allowable tension/ minimum conductor size	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(37)Electronics equipment used for line protection is blown up	Voltage surge	Signal condition sub system. Surge filter	Will replace the electronic board. But the same fault happens again	Will consider the cause of surge. Surge filter / absorber/ diverter will be installed	7762AE Line surge/ application of electronic control system	Develop the skill in line surge/ electronic control.
(38) Receiving end voltage is greater than the sending end	Capacitance effect on long line	Long line 7762AG Power System Operation	Will think that the equipments are designed to operate at the sending end voltage level, it will be enough	Will consider the line configuration and will provide the appropriate arrangement for over voltage caused by capacitance effect on long line.	EP2/EP3 Long Line PI & TEE equivalent circuits	Develop the practical skill in determination of possible voltage rise in simulated line model.
(39)Can not run the generators in parallel	Synchronism problem	Synchronizing	Will not properly know the synchronism	Will consider the synchronism	Alternator parallel operation- Procedure	Develop he knowledge in synchronizing
(40) Over current relay is provided to protect the system but	Characteristics of relays	Relay types and characteristics	Will think that one relay will protect everything	Will select the appropriate relay for appropriate place and	EP13 Study of various protective relays used in	Knowledge development on various protective

it does not work when the ground fault occurs				protection task	industry through trade references	relays used in industry through trade references

Method of delivery	**Method of collection of evidence**
7-Face to face 6-Electronic <u>Key for delivery mode</u> 1-On the job 2-Simulated 3-Blended 4-Self paced 5-Distance 6-Electronic 7-Face to face 8-Other <u>Detailed explanation</u> Face to face class teaching + Online supplement multimedia notes	A,B,D,E,F,G,L Key for Methods for Collecting Evidence: A-Assignment B-Written Task C-Role play D-Exam E-Oral questioning F-Simulation G-Observation H-Work based I-Portfolio J-Self assessment K-Case study L-Practical demonstration M-Project N-Training Record O-Other *Detailed explanation* A+B-Test 1, 2, 3, 4 E-Oral question in practical class F-Simulated practical for line & power system comprising mathematical equations & functions

Evidence **Part 1- Evidence of teaching & learning** **Plan for concurrently delivery** www.powerlearning1.zoomshare.com Both digitised notes + multimedia notes including audio files Notes in USB (Available on request) **Part 2- Evidence of lesson planning** (1) Delivery & assessment matrix excel form (2) Semester plan (3) Students study progress plan (Available on request)	G-Observe the student's performance in practical class L-Student practical performance result + report preparation *Evidence Attached* **Part (1)- Test questions** 2 tests **Part (2)-Evidence of students participation** (1) Signed attendance sheet (2) Signed Test attendance sheet (3) Sample answer paper & practical report Either hard or scanned copy (Will be available on request within 6 months of the assessment event (4) EBS attendance & grade record

1 On the job	**2** Simulated	**3** Blended	**4** Self-paced (facilitated)
5 Distance	**6** Electronic	**7** Face to Face	**8** Other (Please specify)

Key for Methods for Collecting Evidence:

A	Assignment	**B**	Written task	**C**	Role play	**D**	Exam
E	Oral questioning	**F**	Simulation	**G**	Observation	**H**	Work based
I	Portfolio	**J**	Self assessment	**K**	Case study	**L**	Practical demonstration
M	Project	**N**	Training Record Book	**O**	Other (Please specify)		

Location of Evidences (Table 1)

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1		X	
1.2		X	
1.3		X	X
1.4		X	X
1.5		X	X
1.6		X	X
2.1		X	
2.2		X	X
2.3		X	X
2.4		X	X
2.5		X	X
2.6		X	X
2.7		X	X
2.8		X	X
2.9		X	X
2.10		X	X
2.11		X	X
2.12		X	X
3.1	X	X	
3.2	X		
3.3	X		

EKAS Assessment		X	X

POWER SYSTEM Youtube video Lessons to provide the sufficient EKAS

G015/ IS67+68+ IS74

Page 196 to 231 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power System (1)

G015(AA)Lesson 1-Distribution system.zip

http://youtu.be/VuzjXkRx4UI

G015(AA)Lesson 2-Demand factor.zip

http://youtu.be/cUGbxhBT-Dc

http://youtu.be/DCCl4cO3Vu8

G015(AA)Lesson 3-Sag.zip

http://youtu.be/1s496h-Iuu8

G015(AA)Lesson 4-OH Line mechanical design.zip

http://youtu.be/T0BnyqV9T6E

http://youtu.be/hu1TrUv2_OY

G015(AA)Lesson 5-UG Cable.zip

http://youtu.be/hHCLzMnVmT0

http://youtu.be/A5AieaBBZHo

G015(AA)Lesson 6-Voltage control.zip

http://youtu.be/y1vTM5fvfyU

http://youtu.be/Z9HBGsVqymA

G015(AE)Lesson 1-Power system protection scheme.zip

http://youtu.be/ihpd3cDAhBU

http://youtu.be/EGXkLRM2L9M

http://youtu.be/zOIUYQ7OJfs

G015(AE)Lesson 2-Differential relay.zip

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson_3-Over_current_&_earth_fault_protection.zip

http://youtu.be/hvGjdO9jEhk

G015(AE)Lesson 4-Three phase differential relay.zip

http://youtu.be/2iW0oEScMsw

http://youtu.be/VuzjXkRx4UI

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson 5-Current time grading.zip

http://youtu.be/r0qkLrmkKsM

G015AE Lesson 6

http://youtu.be/InsTLh7_N5k

G015(AE)Lesson_7-CT_PT.zip

http://youtu.be/ZF_y65xsM_M

G015(AE)Lesson 8-Distance relay.zip

http://youtu.be/NKzMVquFLu8

http://www.filefactory.com/file/c386a2e/n/G015_AE_Lesson_8-Distance_relay.zip

G015(AE)Lesson 9-Telecom in power protection.zip

http://youtu.be/9C6oqqZAKRq

http://youtu.be/XRpffA6hU_U

http://youtu.be/X-kz3cyL9fU

G015(AG)Lesson 1-Stability.zip

http://youtu.be/fUyNqcXtBXg

G015(AG)Lesson 2-Generator load sharing.zip

http://youtu.be/A-t7XH4rK4M

http://youtu.be/OTsis_KIRuk

http://youtu.be/8j1nD9nY2hU

G015(AG)Lesson 3-Power Flow.zip

http://youtu.be/0OzT4Pol-Jc

http://youtu.be/fK0wcaTY_rw

G015(AG)Lesson 4-IP based system.zip

http://youtu.be/ve5O8K9fL7k

G015(AG)Lesson 5-Surge in power system.zip

http://youtu.be/6WkezTcOzX4

G015(AG)Lesson 6-CTPT Harmonic filter.zip

http://youtu.be/Uy7q9SsaOYs

G015(AG)Lesson 7-Short circuit in alternator.zip

http://youtu.be/b-46Kvn8kJI

G015(AG)Lesson 8-Corona.zip

http://youtu.be/XYGRAWOqzsc

G015(AG)Lesson 9-Power surge.zip

http://youtu.be/uzFS-otIn-g

http://youtu.be/IsZ_ccy630w

G015(AG)Lesson_10-Static_Var_Compensation.zip

http://youtu.be/y-of5oLojCU

G015(AG)Lesson 11-PF Control+Fuel cell.zip

http://youtu.be/AXbCcoQeLns

G015(AG)Lesson_12-Exercises.zip

http://youtu.be/nRGScOH9aSM

G037+G038+G039 Part 1/2/3+IS69
Page 232 to 270 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power System (2)

G037+G038+G039 Lesson 1-Power Flow.zip

http://youtu.be/mzwGGXRTtvw

G037+G038+G039 Lesson 2-Site Earthing.zip

http://youtu.be/PATkXVBF9kc

http://youtu.be/H4Dj1K238BE

G037+G038+G039 Lesson 3-Power System Control Equipments.zip

http://youtu.be/JJczbYVWOoI

G037+G038+G039 Lesson 4-Auxiliary System+Harmonic.zip

http://youtu.be/5mDNHGFLA0c

G037+G038+G039 Lesson 5-Harmonic.zip

http://youtu.be/n41q4Rmz2p0

http://youtu.be/8CelGV5AElk

G037+G038+G039 Lesson 6-Harmonic Calculation.zip

http://youtu.be/NHSzu6HkOgI

http://youtu.be/fSLrPIC6Mho

G037+G038+G039 Lesson 7-Synchronous Generator Loading.zip

:http://youtu.be/jv1q7Mtg7Gs

http://www.filefactory.com/file/c39be2f/n/G037_G038_G039_Lesson_7-Synchronous_Generator_Loading.zip

G037+G038+G039 Lesson 8-Turbine Control+Power Line Earthing.zip

http://youtu.be/0CvgkmDE3Kw

G037+G038+G039 Lesson 9-Insulator.zip

http://youtu.be/l4jqs8MLBFA

http://youtu.be/TiQezIA9Z-c

G037+G038+G039 Lesson 10-Reliability of Power System.zip

http://youtu.be/tIUk3nc1IxE

G037+G038+G039 Lesson 11-Harmonic Reduction.zip

http://youtu.be/8dYX-11kRcc

http://youtu.be/A684Aqej8-w

G037+G038+G039 Lesson 12-Grounding + Power Quality.zip

http://youtu.be/QQPUj3WXJnA

G037+G038+G039 Lesson 13-Power Quality.zip

http://youtu.be/feI7SCb_QTY

http://youtu.be/mcK2YhDsnr0

G037+G038+G039 Lesson 14-Harmonic Model.zip

http://youtu.be/dwWBOq-BsLY

G037+G038+G039 Lesson 15-Harmonic Losses in Transformer.zip

http://youtu.be/mwEJgEEgPVc

http://youtu.be/1A6FY5f5ijM

http://youtu.be/yLiOKy7uJj0

G037+G038+G039 Lesson 16-Reliability Improvement.zip

http://youtu.be/cn-CfDWnUN8

G037+G038+G039 Lesson 17-Preparation for emergency.zip

http://youtu.be/La7Xip8GI2I

G037+G038+G039 Lesson 18-Harmonic problems.zip

http://youtu.be/0Urnkee_

http://youtu.be/zM_Xcwckicw

G037+G038+G039 Lesson 19-Synchronous machine problems.zip

http://youtu.be/Lx2S-NATr20

G037+G038+G039 Lesson 20-Power Generation + Generator Control.zip

http://youtu.be/56Ks8sArQxc

G037+G038+G039 Lesson 21-Turbine Control+ Digital Excitation.zip

http://youtu.be/uCsvv18qKwQ

http://youtu.be/I4vCDI2CZS0

G037+G038+G039 Lesson 22-Power System Protection.zip

http://youtu.be/c6iXRwfCYBU

G037+G038+G039 Lesson 23-Switch Gear.zip

http://youtu.be/DDpbzgNYTiM

http://youtu.be/2cl-nOdBNro

G040 + IS73

Page 271 to 284 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power transformer

G040 Lesson 1 Power transformer rating 1.zip

http://youtu.be/qjWJVQAh_jA

G040 Lesson 1 Power transformer rating 2.zip

http://youtu.be/JonzO8JD-k4

G040 Lesson 2 Open circuit short circuit test.zip

http://youtu.be/Ru-KlKv40OY

G040 Lesson 3 Transformer regulation.zip

http://youtu.be/t6IZMwMj-B4

G040 Lesson 4 Power transformer connection.zip

http://youtu.be/iig8PISDN1I

G040 Lesson 5 Maximum efficiency.zip

http://youtu.be/Qa7l0eHTWTU

G040 Lesson 6 Transformer parallel operation.zip

http://youtu.be/dkRxoaozrOk

http://youtu.be/Sz5QY727w-8

G040 Lesson 7 Harmonic in transformer.zip

http://youtu.be/_YOlWb3e574

G040 Lesson 8 Transformer problem + auto transformer.zip

http://youtu.be/0KCscbCIUjk

G040_Lesson_9_Transformer_rating_cooling_connection_tap_changing.zip

http://youtu.be/d3XHm-wguzQ

http://youtu.be/XwiIkZnKFqQ

http://youtu.be/uOHBk840Bhw

G040 Lesson 10 Phase shift transformer.zip

http://youtu.be/7aWhg9DIoWI

G042+IS71

Page 285 to 307 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Transmission Line

G042 Lesson 1-Transmission line introduction.zip

http://youtu.be/DrOOqcKeaL4

G042 Lesson 2-DC Line+Line reflection.zip

http://youtu.be/jvVdecp-clk

G042 Lesson 3-Power line calculation.zip

http://youtu.be/3TgVt67DhvY

http://youtu.be/QT6aqsaM7a0

http://youtu.be/WxjQIkdJjQ8

G042 Lesson 4-Line model+Economic aspect.zip

http://youtu.be/1HRdGZXp_-w

G042 Lesson 5-Time value of money+Line reflection.zip

http://youtu.be/n9mupLQWANY

http://youtu.be/YdfiX2gL-3c

G042 Lesson 6-Line matching+Wave guide.zip

http://youtu.be/1WyP5_Cek40

G042 Lesson 7-Wave guide.zip

http://youtu.be/BuGtjZ3QBXk

http://youtu.be/pftevsnbl0w

G042 Lesson 8-Microstrip line.zip

http://youtu.be/eINq1kKuiec

G042 Lesson 9-Per unit value of line.zip

http://youtu.be/66Y-Lm3EntI

G042 Lesson 10-Line constants.zip

http://youtu.be/2XYnZZ-zXII

G042 Lesson 11-Smith chart.zip

http://youtu.be/dv-NQh4vlrg

http://youtu.be/KfM8XZd9Wqc

http://youtu.be/3NYVQvW8-Nk

http://youtu.be/5qBwLsbtfTA

http://youtu.be/ViamcvqAy_I

http://youtu.be/j_nx9n7mGec

http://youtu.be/d53B3-zV2ec

G042 Lesson 12-Four terminals network.zip

http://youtu.be/HCO4P1qrPbA

G042 Lesson 13-Exercises.zip

http://youtu.be/LeyJf1PhpCY

Power References

http://electricaldiploma2013.zoomshare.com/files/powerreference.htm

Advanced Diploma in Electrical Engineering Exercises

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Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with IS68+IS74 Assessment Mapping.pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	**UETTDRIS68A Solve problems in energy supply protection equipment**		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1 Prepare to solve problems in energy supply network equipment	1.1	OHS procedures for a given work area are identified, obtained and understood	Q 1,2,3 of IS68+IS74 Assessment Mapping.pdf (Page 2)		
	1.2	OHS risk control measures and procedures in preparation for the work are followed	Q 4 to 7 of IS68+IS74 Assessment Mapping.pdf (Page 2)		
	1.3	The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)	Q 8 of IS68+IS74 Assessment Mapping.pdf (Page 2)		
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.	Q 9 to 12 of IS68+IS74 Assessment Mapping.pdf (Page 3)		
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.Submit the following assignment questions			Advanced Diploma in Electrical Engineering Exercises Page 208) Q11+12 Advanced Diploma in Electrical Engineering Exercises Page 123)Q 1 to 7

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
	1.6	Tools, equipment and testing devices needed to take measurements are obtained in accordance with established procedures and checked for correct operation and safety		Practical EP9,EP10,	Advanced Diploma in Electrical Engineering Exercises Page 128) Q52+53
2.Solve problems in energy supply network protection equipment and system.	2.1	OHS risk control measures and procedures for carrying out the work are followed.	As per 1.1 to 1.3		
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures		Practical EP11.EP12	Advanced Diploma in Electrical Engineering Exercises Page 126) Q30 to 37
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures	As per 1.3		
	2.4	Safety hazards resulting from the reports and risk control measures devised and implemented in consultation with appropriate personnel.	As per 1.3		
	2.5	Problem solving is approached methodically drawing on knowledge of energy supply network protection equipment and systems using measured and calculated values of circuit/apparatus	Test 1 Q 1 to 10		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
		parameters.			
	2.6	Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage			Advanced Diploma in Electrical Engineering Exercises Page 128)Q55 to 59
	2.7	Circuits/components are rechecked and their operational status is confirmed.			Advanced Diploma in Electrical Engineering Exercises Page 128)Q64 to 70
	2.8	Materials/replacement parts required to solve problems are sourced and obtained in accordance with established procedures.			Advanced Diploma in Electrical Engineering Exercises Page 126) Q23 to 29
	2.9	Effectiveness of the repair is tested in accordance with established procedures.	As per 1.3		
	2.10	Apparatus is reassembled, finally tested and prepared for return to service.	As per 2.5		
3.Completion and report for problem solving in energy supply network equipment	3.1	OHS work completion risk control measures and procedures are followed.	As per 1.3		
	3.2	Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.		Project	Advanced Diploma in Electrical Engineering Exercises Page

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
					125) Q 17 to 19
	3.3	Maintenance work activities are documented in accordance with established procedures.		Project	Advanced Diploma in Electrical Engineering Exercises Page 125) Q 17 to 19

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Connection of relay protection scheme & protective equipments by using one line diagram		EP9	
Current transformer & potential transformer connection & ratio test		EP10	
Over current relay characteristics		EP11	
Electronic relay test		EP12	
Study of various protective relays used in industry through trade references			Research Assignment

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 Protection fundamentals encompassing:	Q 1,2,3 of Test 1		

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T2 Instrument transformers for protection			Advanced Diploma in Electrical Engineering Exercises Page 125) Q 38 to 52
T3 Feeder protection	Q7 of Test 1		Advanced Diploma in Electrical Engineering Exercises Page 125) Q 23 to 37
T4 Transformer protection	Q10 of Test 1		Advanced Diploma in Electrical Engineering Exercises Page 125) Q 10 to 15
T5 Busbar protection			Advanced Diploma in Electrical Engineering Exercises Page 125) Q 16 to 19
T6 Surge protection			Advanced Diploma in Electrical Engineering Exercises Page 131) Q 16 to 18

Add rows to the following table as required

Assessment Conditions	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments Records relating to electrical engineering resources	Test	Practical EP 9 to 12	Research Assignment

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UETTDRIS68A Solve problems in energy supply protection Equipment

ONLINE RESOURCES ARE SUPPORTED THE STUDENTS TO ACQUIRE THE COMPETENCIES

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

1 Prepare to solve problems in energy supply network equipment

1.1 OHS procedures for a given work area are identified, obtained and understood

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q15+16

www.electricaldiploma2013.webs.com Then access Click **HERE** to download the Exercises

http://www.mongroupsydney1.com/Advanced_Diploma_in_Electrical_Engineering_Exercises_EE011.pdf

Relevant Instruction Lessons

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

Q1.Describe the risks and dangers in power station and outline the recommended safety
Q2.equipments and emergency procedures.
Q3.Outline the process of maintenance work in substation.

1.2 OHS risk control measures and procedures in preparation for the work are followed

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q17+18 Page 4 Q21+22

Q4. Write down the check list to perform the tasks in substation.
Q5. Write down the safety procedures and methods to assess the risk and to reduce the risk.
Q6..Write down the code of practice for working near exposed main and apparatus.
Q7.Which precautions are to be emphasized when working in substation?

1.3 The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)

Q8. Write down the risk reduction procedures in maintenance work to discuss with work manager. (Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)

1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.

Answer the following questions to seek the advice from work supervisor in the following aspects.
Q9. What are the risks?
Q10.How are the risks classified?
Q12.How can the risk be evaluated?
Q12.How will you manage the risk? Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q8 to 11)

1.5 Sources of materials that may be required for the work are established in accordance with established procedures.

Submit the following assignment questions
Ref-Advanced Diploma in Electrical Engineering Exercises Page 123)
The practice questions are organized to find out the protection system equipments and materials together with relevant theory
15) Over current and earth fault protection
Slide 1+2
Q1.Sketch three phase over current protection.
Q2.Sketch three phase earth fault relay protection.
Slide 3+4+5

Q3.Explain the operation of directional element with sketch.
Slide 6
Q4.Locate the position of reverse power relay in power line.
Slide 7
Q5.Sketch the connection of combined protection scheme that contains two over current relays &
one earth fault relay to provide phase to phase and earth protection.
Q6.How does directional element of relay perform?
Slide 8
Q7.Locate directional and non directional element in a ring circuit.
1.6 Tools, equipment and testing devices needed to take measurements are obtained in accordance with established procedures and checked for correct operation and safety.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 128)
.Testing of protection current & potential transformer and relevant questions are arranged to provide this competency component.
Slide 5
Q52.Explain (a) AC ratio check (b) DC polarity check (c)Three phase polarity test for three phase CT
Slide 6
Q53.How will you interpose & sum CT & PT?

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/IS68 Assessment 1 /Question Marking scheme Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/IS68 Assessment 1/ Assessment Cover Sheet Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS68 Assessment 1/ Assessment Feedback Sheet
Students' work in own	Summative Assessment- Formal	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS68 Assessment 1 /

record	Tests	Student Work
	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS68 Assessment 1 / Student Work Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 2016 Attendance Records+Record Book

2 Solve problems in energy supply network protection equipment and system.

2.1 OHS risk control measures and procedures for carrying out the work are followed.

As per 1.1 to 1.3

2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 126)

Live testing of protective relay system and depermination of characteristics and relevant questions are arrrranged to provide this competency component.

(25) Distance protection scheme

Slide 1

Q30.Explain the distance protection scheme with sketch.

Slide 2

Q31.Explain the operation and construction of distance relay with sketch.

Slide 3

Q32.Explain the characteristics of distance relay.

Slide 4

Q33.Describe the directional distance relay with sketch.

Slide 5

Q34.What is the relation between maximum reach & relay characteristics.

Slide 6+7

Q35.Explain the zones for distance protection scheme.

Slide 8

Q36.Explain the operation of three phase distance relay.

Slide 9

Q37.Explain maximum reach and maximum reach angle.

2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures

As per 1.3

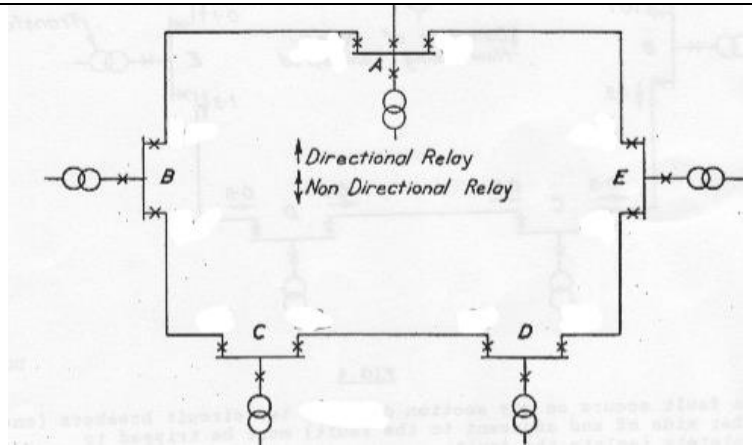
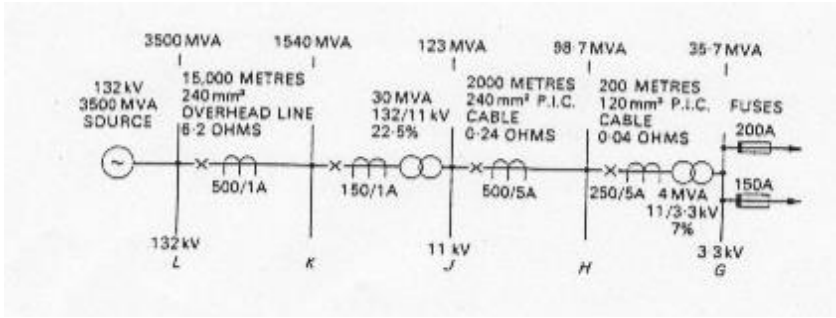
2.4 Safety hazards resulting from the reports and risk control measures devised and implemented in consultation with appropriate personnel.

As per 1.3

2.5 Problem solving is approached methodically drawing on knowledge of energy supply network protection equipment and systems using measured and calculated values of circuit/apparatus parameters.

2.12 Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

EKAS COMPONENT	Question No	Questions
KS01-TIS68A Electrical power system protection Evidence shall show an understanding of protection methods and devices for electrical power systems to an extent indicated by the following aspects: T1 Protection fundamentals encompassing: • purpose of protection • features of a protection scheme T2 Instrument transformers for protection encompassing: • Operating principles • Applications of current transformers • Applications of voltage transformers T3 Feeder protection encompassing: • fuse protection • overcurrent & earth fault • sensitive earth fault • unit schemes • distance protection • trip/close sequences for feeders • recloser/sectionaliser systems T4 Transformer protection encompassing: • overheating protection • overcurrent protection	1 2 3 4 5	What is power system protection scheme? (5 marks) What equipments are included in power system protection scheme? (5 marks) Explain the functions of the following devices included in a power system protection Scheme. CT, PT, Fault Detector, Tripping Circuit (10 marks) Sketch the construction of • Balanced Beam Relay Connection Diagram of Relay Tripping Circuit (10 marks) Sketch the connection diagram of combination protection scheme that contains two Over current relays and one earth fault relay to provide phase to phase and phase to earth protection.. (10 marks)

▯ restricted earth fault protection ▯ differential protection ▯ oil and gas devices T5 Busbar protection encompassing: ▯ types of fault ▯ requirements of busbar protection ▯ system protection ▯ frame-earth protection T6 Surge protection encompassing: ▯ voltage surges ▯ surge diverters ▯ arcing horns	6 7 Total 70 marks 8 9 10 Total 100 marks	 Locate relay protection scheme for given system when fault occurs at point F. (20 marks) Sketch curve for discrimination by both time and current of the following power system..  (20 marks) How will you adjust Definite Minimum Time point on relay curve? (5 marks) What is “Pick Up” of relay? (5 marks Sketch the vector diagram for primary, secondary main windings of

		Star Delta Power Transformer . (10 marks)

2.6 Circuit/apparatus components are dismantled where necessary and parts stored to protect them against loss or damage

Ref-Advanced Diploma in Electrical Engineering Exercises Page 128)

To convert the analog relaying system to digital relay system, the dismantling of origin components and assembly of new system components are to be done. The following questions and activities provide this competency component.

(29) Digital relay+ Telecommunication for protection

Slide 1

Q54.What is digital relay?

Slide 2+4

Q55.Sketch the flow diagram of digital relay operation.

Slide 3+4

Q56.Sketch DAC system

Slide 5

Q57.Explain busbar protection with sketch

Slide 6

Q58.Write line & busbar protection with sketch.

Slide 7

Q59.Sketch the operation of digital relay.

2.7 Circuits/components are rechecked and their operational status is confirmed.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 129)

To determine the operational status of protection system, it needs to ensure relay operation sequence, the sequential relay protection system and characteristics are to be investigated. The following activities and questions provide this competency.

(32)Over current & earth fault protection , Directional protection, operating characteristics

Slide 1

Q64.Sketch the diagram of over current protection

Slide 2

Q65.Sketch earth fault relay protection diagram.

Slide 3

Q66.Sketch the combined over current and earth fault protection and explain it’s operation.

Slide 4

Q67.Explain the operation of directional relay with diagram.

Slide 5+6+7+8

Q68.Locate directional & non directional elements in ring system.
Slide 9+10
Q69.Sketch the connection diagram of combinational protection scheme that contains two over current relays and one earth fault relay to provide phase to phase and phase to earth protection.
Slide 11
Q70.How will you adjust definite minimum time point on relay curve?
2.8 Materials/replacement parts required to solve problems are sourced and obtained in accordance with established procedures.
2.9 Effectiveness of the repair is tested in accordance with established procedures.
2.10 Apparatus is reassembled, finally tested and prepared for return to service.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 126)
When more power loads are connected to transmission line, the current protection system needs to be modified. The following questions and activities provide this competency component.
(23) Transmission line protection
Slide 1
Q23.Sketch transmission line differential protection
Slide 2+3
Q24.Sketch the modification diagram for transmission line protection with differential relay.
---
(24) Distance relay, pilot wire with differential three phase line protection
Slide 1
Q25.Explain the operation of distance relay
Slide 2
126
Q26.Explain the operation of distance relay with sketch
Slide 3+4
Q27.Sketch the characteristics curve of distance relay
Slide 5+6
Q28.Explain the zone protection of distance relay.
Slide 7+8
Q29.Sketch the protection diagram of distance relay with operating & restraining voltage and current.
2.11 Unexpected situations are dealt with safely and with the approval of an authorised person.
As per 1.3
2.12 Problem solving activities are carried out without damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.

As per 2.5

Location of Evidences (Table 1)

3.Completion and report for problem solving in energy supply network equipment

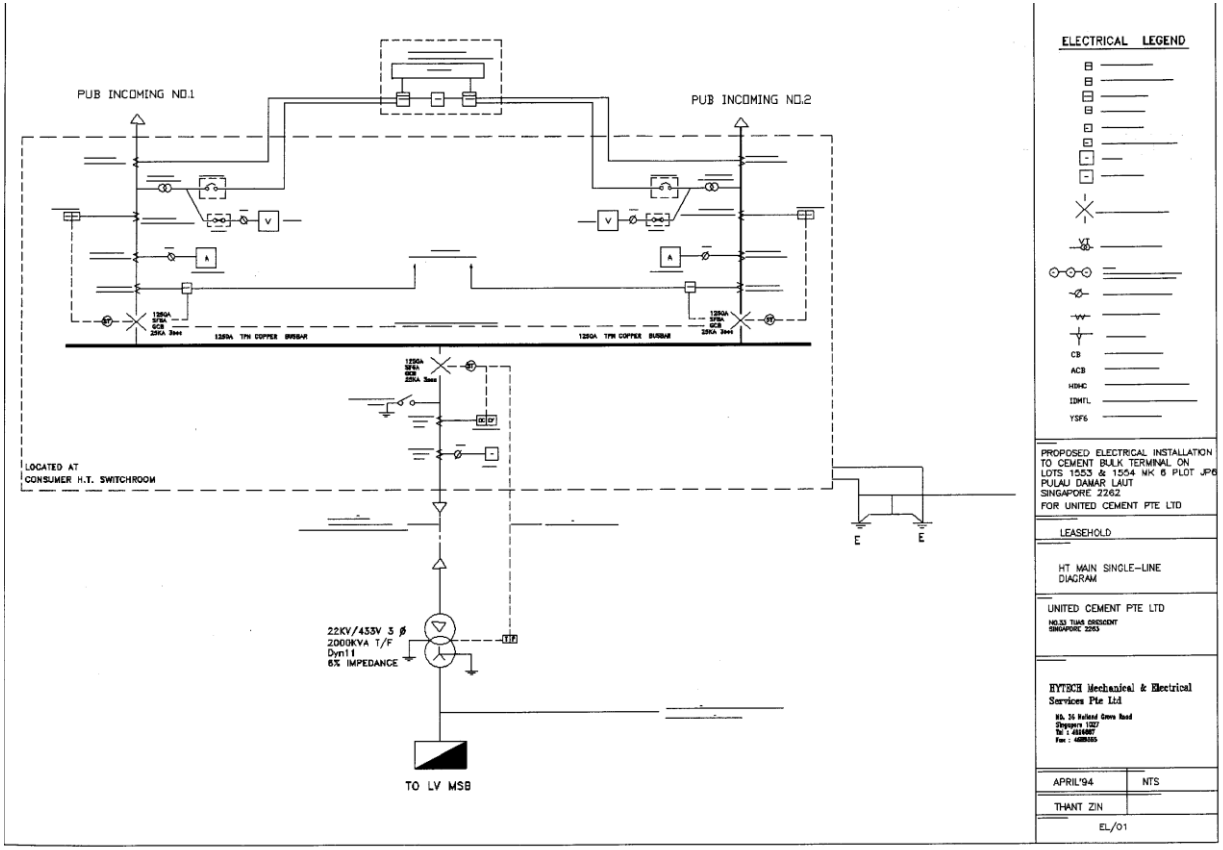
3.1 OHS work completion risk control measures and procedures are followed.

As per 1.3

3.2 Reusable, faulty or worn components are tagged and dispatched for repair to maintain adequate spares.

3.3 Maintenance work activities are documented in accordance with established procedures.

POWER SYSTEM PROTECTION COMMISSIONING PROJECT



The above diagram is Incoming HV supply system for a Cement Factory. It contains Star –Delta Transformer, Interchange switches for switching 2 supply, sketch of protective relay system with trip circuit and outline for measuring instruments.

(1) Develop Detail installation diagram that contain appropriate protection instruments and measurement instruments

(2) Recommend appropriate specifications for protection and measuring instruments for power supply requiring 500Kw for the factory.
By answering the following questions, the concepts for the above project can be highlighted

Ref-Advanced Diploma in Electrical Engineering Exercises Page 125)

(19) Three phase differential relay
Slide 1
Q17.Sketch three phase star/ delta transformer protection with differential relay.
125
Slide 2
Q18.Explain the setting of differential relay.
---
(20) Connection of main transformer, CT , directional relay
Slide 1+2+3
Q19.Sketch the combined earth fault and differential protection for three phase star/ delta transformer.

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Refer Power System Practicals

Part 1: Operational Study

Lab No	Name of Practical	Equipments	Assessment
	Group 1 Power & Line		
EP1	Receiving end voltage comparison between short/ medium and long transmission lines	distribution system types	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion

EP2	Long transmission line PI equivalent circuit	overhead systems	As above
EP3	Long transmission line T equivalent circuit	distribution system types	As above
EP4	Transmission line efficiency/ Transformer effect on line efficiency	energy metering • demand meters	As above
EP5	Reactive power and power factor improvement	energy metering • demand meters	As above
EP6	PF effect on line current	energy metering • demand meters	As above
EP7	Corona Video	• surge protection	Report presentation, conclusion
EP8	Phase sequence measurement		Competency assessment
	GROUP 2- Protection equipments		
EP9	Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply)	protection equipment and systems	Competency assessment
EP10	Current transformer & potential transformer connection & ratio test	current transformers • potential transformers	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP11	Over current relay characteristics	protection equipment and systems • over-current protection	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP12	Electronic relay test	conventional relays • electronic relays	As above
EP13	Study of various protective relays used in industry through trade references	• earth fault protection • differential protection busbar protection	Research, report presentation

		• surge protection • conventional relays	
	Group 3- Supply System		
EP19	Underground cable capacitance test	underground systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP20	High tension line design	• overhead systems	Design project
EP21	Line insulator test & capacitance grading	• overhead systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP22	Voltage profile chart of distribution system	• voltage regulation equipment • on load tap changers	As above
EP23	Load centre-Power loss comparison	• distributor equipment	As above
EP30	Transformer polarity test	• distributor equipment	As above
EP42	Maximum power transfer theorem with power circuit	• load control	As above
EP43	Load flow study	• load control	As above
EP45	Trade reference study, switch board, busbar, insulator, circuit breakers	reclosers / sectionalisers.	As above

2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

2.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to system and the surrounding environment or services and using sustainable energy practices.

General faults including: open-circuit; short-circuit; incorrect connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure for the equipments in the range

(2)**Explore some of the faults in power system/ energy supply that can be rectified only by utilizing para-professional knowledge background and how the arranged simulated practical can provide the hand on experience and work performance for the students and how it is different from the performance only based on trade level activities.**

In range of performance, it outlines the real equipments used in the industry. There will be the arguments that the setting of practical in lab room only includes rheostat, resistor, varic, capacitor etc. How it meets the outlined competencies?
To exactly find out and rectify the faults in energy supply system , the tasks and complexity level more than the trade level- (check the continuity, check the connection, visual inspection, testing and measurement)will be included.
The following is the various power system faults which I draw out from my power engineer work records that the technical knowledge higher than trade level is required to successfully rectify the fault and determine the appropriate solutions. In the table, I summarize how the fault is , caused, background theory, how the person who knows the theory will do, how the person who does not know the theory will do and how my simulated practical / and practical related background theory will assist to develop the fault finding skill.

Typical fault	**Cause**	**Related Theory**	**How the person who does not know the theory will do**	**How the person who knows theory will do**	**Name of simulated practical**	**How to develop the skill**
(1)In reticulation system, there is abnormally different in	Abnormal resistance. Wrong cable selection. Abnormal circuit	Voltage profile chart.	May give he other idea to change the load	Measure voltage, sketch the voltage profile chart. Then identify the portion of	EP 23 Voltage profile chart	Develop the analytical skills to identify the fault point

voltages	configuration			the circuit.		
(2)Line conductor slips from the pin insulator	Line deviation is too high, combination of wind, conductor tension will take away the conductor from pin insulator	Line deviation angle calculation	Will reinstall the line. After some period, he same thing will happen again	Will examine line deviation angle. Tension, wind force. Will rearrange the line or provide shackle insulator	Theory instruction. Line deviation	Develop the problem solving skill on line construction.
(3)Conductor sag too low. Hit by traffic and then broken	Sag calculation. Wrong tension, safety factor, weight	Sag/ line design	Pull up the cable. After some time, it will fall again	Will examine the related parameters and find the way	EP 20 High Tension Line Design	Develop the skill on line design and to know the technical factors for sag.
(4)Discharge current flows out from underground insulator and cause the injury	UG cable capacitance. Charging current	UG Cable capacitance test	Will think about current flow, leakage etc.	Will examine the UG cable capacitance and produce the procedure for discharging	EP 19 Underground cable capacitance test	Develop the skill in UG cable testing focus on capacitance and estimate the amount of charging current
(5)Line pole broken without natural disaster	In appropriate pole strength	Pole mechanical design	Will erect the pole. Some time after, broken gain	Will examine he tension, wind force, conductor weight, then will calculate the pole strength and select appropriate diameter of pole and appropriate pole material	Pole mechanical design lesson + EP 20 High tension line design	Develop the skill on line design and to know the technical factors for pole.

2 Complete and report fault diagnosis and rectification activities.

3.1 OHS work completion risk control measures and procedures are followed.

3.2 Work site is made safe in accordance with established safety procedures.

As per 1.3

3.3 Rectification of faults is documented in accordance with established procedures.

3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Fault	Reason	Related theory	The person who does not know the theory will do	The person who knows the theory will do	Related Practical	Development of skill
(6)There are too much power loss. Line efficiency is poor	If all connected loads are all right, wrong location of power station/ load centre	Load centre study	Will not take account on load centre	Will take account on load centre	EP23 Load centre power loss comparison	How the location of supply source affect line losses/ efficiency and % voltage regulation
(7)Problem with UG cable joint	Wrong method in UG cable joining	UG cable joining methods. Theory study			UG cable joining method in my prepared 7762 AA Electrical Distribution textbook	UG cable joining methods. Theory PLUS photographs
(8)Generator got motor action. Reverse power relay cuts off	Out of synchronism. Up to 180 degree out of phase	Synchronizing	Will neglect synchronism. Just run and switch on	Will focus on synchronizing process. Avoid reverse power relay operation	Synchronizing	Synchronism, generator parallel operation requirement practical knowledge development.
(9)Generator vibration/ hunting	Stability concept	System stability	Do not care on machine hunting. Will continue to run . As consequence, face the short life of bearing/ shaft	Will take care on transient and steady state system stability and prevent the hunting	Moment of inertia/ machine stability	Moment of inertia/ machine stability practical knowledge development.
(10)Relay operates on fault. But the system loss the synchronism	System stability/ critical fault clearing angle aspect.	System stability/ critical fault clearing angle	Do not care on the relay setting to provide both fault protection and maintain the system stability. Re-synchronize the generators when ever the relay operates	Will set the proper relay setting to maintain the stability	Critical fault clearing angle. Equal area criteria	Critical fault clearing angle. Equal area criteria practical knowledge development.
(11) Line reactive power too much. The equipment capacity is unnecessarily increased	Problem related to load flow	Load flow study	Will not take account on load flow concept.	Take account on load flow and optimize the loading	EP 42 Maximum power transfer theorem EP43 Load flow study	Develop the load flow concept and practical optimizing skill
(12)There is nothing wrong with the line but the transformer placed near the switch heat up and cooked	Switching surge	Switching voltage surge	Just replace the transformer. After some time, the same problem will be faced	Take account on switching voltage surge and plan tom install the surge diverter.	Switching voltage surge	Switching voltage surge practical knowledge development.
(13)Light radiated	Corona	Corona study	Will consider the ACT	Will find the way to	EP 7 Corona video	How corona occurs

from the power line. Too much power loss and high interference to telecom line			OF GOD	reduce corona such as application of hollow conductor to increase diameter of conductor to raise the critical voltage level		and find the way to prevent .
(14) Control telecommunication for power line down, no relay operates	Application of telecommunication system in power system operation	Application of telecommunication system in power system operation 7762AG Power System Operation	Will not be aware of the role of telecommunication system	Will check the function of telecom equipment for power system control and protection and perform the preventive maintenance	Application of telecommunication system in power system operation	Web based control/ IP based control and telecomm: concepts practical knowledge development.
(15)Too much flickering of lamps	Harmonics	Harmonics in power system	Will not know what happens	Will check the harmonics source/ increase the size of neutral wire to allow the harmonics current flows	Harmonic source scope observation	Development of identifying the harmonics
(16)Lightning strike	Lightning arrester	Lightning arrester	Will reinstall LA. But not sure it will be safe or not.	Will check the coverage provided by lightning arrester	Lightning arrester study	Lightning arrester practical knowledge development.
(17)Earth fault/ earth leakage can not be protected	Grounding in power system	Grounding in power system 7762AE Power System Protection	--	Will measure the ground resistance, will implement the additional ground connections	Power system grounding study	Power system grounding practical knowledge development.
(18)Occurance of over current	Over current protection	Over current relay 7762AE Power System Protection	Will not exactly know how to set/ adjust the over current relay	Will set/ adjust the over current relay	EP11 Over current relay characteristics	Practical skill development in over current relay
(19)Earth leakage fault	Earth leakage protection	Earth leakage protection 7762AE Power System Protection	Will not exactly know how to set/ adjust the earth leakage relay	Will set/ adjust the earth leakage relay/ CT arrangement	CT arrangement for earth leakage fault & fault in protected zone	Practical skill development in earth leakage fault protection
(20)Transformer protection	Differential relay	Differential relay	Will not exactly know how to set/ adjust the differential relay	Will set/ adjust the differential relay	CT arrangement for fault in protected zone	Practical skill development in differential protection
(21)Line is protected by differential/ over current relay. But it is not effective when the load are fed from some part of the line	Distance relay	Distance relay	Will not exactly determine the reason why and how to change the protection system	Will change the protection system and will calculate earth fault impedance	Earth fault calculation	Problem solving skill development in earth fault calculation
(22)Fault happens but the relay can not	CT/ PT ratio for relay	Relay protection scheme	Will not exactly determine the reason	Will adjust CT PT ratio at the simulated fault	EP9 Connection of	Practical skill development in CT PT

provide the effective protection			why and how to change the protection system	situation and will adjust the relay setting appropriately	relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply) EP10 Current transformer & potential transformer connection & ratio test	ratio adjustment
(23) I accidently open the CT secondary and it got explosion	Current transformer	Current transformer		Will make sure not to open circuit the CT secondary	EP10 Current transformer & potential transformer connection & ratio test	Develop the skill on CT/ PT connection & applications.
(24) we use old type gravity relay, it does not provide the effective protection	Restrainting system of relay	Relay types & characteristics		Will make sure to correctly arrange the relay position	EP13 Study of various protective relays used in industry through trade references	Knowledge development on various protective relays used in industry through trade references
(25) Relay operates at wrong current	Operation/ setting of relay	Relay types & characteristics	Trial error approach will be used	Will make sure to correctly arrange the relay setting	EP11 Over current relay characteristics	Practical skill development in over current relay
(26)In power transformer protection. Transformer is Star/Delta connection.	Transformer Star Delta & relay star/delta matching	Star delta vector diagram. Transformer star side –Relay delta & transformer delta—Relay star	Will not know what happens and how to rectify the fault	Will check the connection and will consider the vector difference causes the wrong operation	EP10-CT & PT connection/ ratio check	Practical skill development in CT/PT Connection

All relay settings are correct. But relay wrongly operates. I checked all continuity. Every thing all right						
(27)Regulator is set to meet the system voltage condition. But later time, it is blown out	Voltage ratio/ regulator setting	Voltage regulator	Will emphasize in solving the problem for a short moment. Will not consider the long term impact	Will consider whether the setting to upgrade the voltage will impact on future system voltage change	EP22 Voltage profile chart of distribution system	The skill training to develop the judgment of voltage level and future impact
(28)Fault spread from one busbar to another busbar	Busbar arrangement/ sectionalization	Busbar arrangement	Will assemble he busbar to install the equipment, will not consider how the arrangement can contribute the spread of fault	Will consider the way to insert section circuit breakers	Busbar layout/ arrangement study	Busbar arrangement sketch/ plan practice development
(29)Equipment suffers over voltage and blown out after the capacitor value is changed for PF improvement	Inappropriate capacitor setting. Cause of overvoltage. Vector diagram	PF improvement/ Capacitive reactance effect on load	Will only see the way to improvement the PF. Will not know the consequences	Will posses the knowledge of capacitor impact on load voltage and will take account on optimal setting of capacitor value	EP5-capactance effect on line EP6-PF Improvement	PF improvement method is judgment with capacitor effect causes over voltage. This skill is trained.
(30)Directional relay does not work to protect the reverse power flow	Directional relay operation	Study on directional relay.		Wrong connection to direction coil will be identified	EP 13 Protective relays used in industry	Guide to acquire the relevant technical knowledge
(31)Voltage flashing over capacitor string	Capacitor string	Study on capacitor string	Will change the capacitor string	Will provide the preventive protection such as arcing horns OR take account on line capacitor grading	EP21 Line insulator capacitance test	Develop the skill to measure line capacitor value . Capacitance grading.
(32)Circuit Breaker itself is blown out	Circuit Breaker capacity	Study on capacity of circuit breaker	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault	EP13 Relay & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(33)CB too hot and meltdown	CB capacity/ Arc development	Study on capacity of circuit breaker/electric arc	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault Will consider the arc	EP13 Rely & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity

				extinguishing methods		
(34)Need to expand the line in emergency. I am only in-charge	Line design	Line design project	Will not know how to design a line	Will utilize references/ methods to design and construct the line	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(35)HV current flows into LV line	Separation between HV & LV line	Rules & regulations related to line	Will not know the regulation	Will apply the regulation in real wok	7762AA Line pole/ cross arm design and conductor arrangement	Line electrical & mechanical design practice development
(36) Line wire fracture	Sag calculation	Sag calculation/ minimum cable size	Reinstall the line wire. Like part to like part replacement is applied, will use the same size of cable. After sometime, line will break gain	Will consider allowable tension/ minimum conductor size	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(37)Electronics equipment used for line protection is blown up	Voltage surge	Signal condition sub system. Surge filter	Will replace the electronic board. But the same fault happens again	Will consider the cause of surge. Surge filter / absorber/ diverter will be installed	7762AE Line surge/ application of electronic control system	Develop the skill in line surge/ electronic control.
(38) Receiving end voltage is greater than the sending end	Capacitance effect on long line	Long line 7762AG Power System Operation	Will think that the equipments are designed to operate at the sending end voltage level, it will be enough	Will consider the line configuration and will provide the appropriate arrangement for over voltage caused by capacitance effect on long line.	EP2/EP3 Long Line PI & TEE equivalent circuits	Develop the practical skill in determination of possible voltage rise in simulated line model.
(39)Can not run the generators in parallel	Synchronism problem	Synchronizing	Will not properly know the synchronism	Will consider the synchronism	Alternator parallel operation- Procedure	Develop he knowledge in synchronizing
(40) Over current relay is provided to protect the system but it does not work when the ground fault occurs	Characteristics of relays	Relay types and characteristics	Will think that one relay will protect everything	Will select the appropriate relay for appropriate place and protection task	EP13 Study of various protective relays used in industry through trade references	Knowledge development on various protective relays used in industry through trade references

Method of delivery	**Method of collection of evidence**
7-Face to face 6-Electronic Key for delivery mode 1-On the job 2-Simulated 3-Blended 4-Self paced 5-Distance 6-Electronic 7-Face to face 8-Other Detailed explanation Face to face class teaching + Online supplement multimedia notes **Evidence** **Part 1- Evidence of teaching & learning** **Plan for concurrently delivery**	A,B,D,E,F,G,L Key for Methods for Collecting Evidence: A-Assignment B-Written Task C-Role play D-Exam E-Oral questioning F-Simulation G-Observation H-Work based I-Portfolio J-Self assessment K-Case study L-Practical demonstration M-Project N-Training Record O-Other *Detailed explanation* A+B-Test 1, 2, 3, 4 E-Oral question in practical class F-Simulated practical for line & power system comprising mathematical equations & functions G-Observe the student's performance in practical class L-Student practical performance result + report preparation

www.powerlearning1.zoomshare.com Both digitised notes + multimedia notes including audio files Notes in USB (Available on request) **Part 2- Evidence of lesson planning** (1) Delivery & assessment matrix excel form (2) Semester plan (3) Students study progress plan (Available on request)	*Evidence Attached* **Part (1)- Test questions** 2 tests **Part (2)-Evidence of students participation** (1) Signed attendance sheet (2) Signed Test attendance sheet (3) Sample answer paper & practical report Either hard or scanned copy (Will be available on request within 6 months of the assessment event (4) EBS attendance & grade record

1 On the job	**2** Simulated	**3** Blended	**4** Self-paced (facilitated)
5 Distance	**6** Electronic	**7** Face to Face	**8** Other (Please specify)

Key for Methods for Collecting Evidence:			
A Assignment	**B** Written task	**C** Role play	**D** Exam
E Oral questioning	**F** Simulation	**G** Observation	**H** Work based
I Portfolio	**J** Self assessment	**K** Case study	**L** Practical demonstration
M Project	**N** Training Record Book	**O** Other (Please specify)	

Location of Evidences (Table 1)

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1		X	
1.2		X	
1.3		X	X
1.4		X	X
1.5		X	X
1.6		X	X
2.1		X	
2.2		X	X
2.3		X	X
2.4		X	X
2.5		X	X
2.6		X	X
2.7		X	X
2.8		X	X
2.9		X	X
2.10		X	X
2.11		X	X
2.12		X	X
3.1	X	X	
3.2	X		
3.3	X		
EKAS Assessment		X	X

POWER SYSTEM Youtube video Lessons to provide the sufficient EKAS

G015/ IS67+68+ IS74

Power System (1)

G015(AA)Lesson 1-Distribution system.zip

http://youtu.be/VuzjXkRx4UI

G015(AA)Lesson 2-Demand factor.zip

http://youtu.be/cUGbxhBT-Dc

http://youtu.be/DCCl4cO3Vu8

G015(AA)Lesson 3-Sag.zip

http://youtu.be/1s496h-Iuu8

G015(AA)Lesson 4-OH Line mechanical design.zip

http://youtu.be/T0BnyqV9T6E

http://youtu.be/hu1TrUv2_OY

G015(AA)Lesson 5-UG Cable.zip

http://youtu.be/hHCLzMnVmT0

http://youtu.be/A5AieaBBZHo

G015(AA)Lesson 6-Voltage control.zip

http://youtu.be/y1vTM5fvfyU

http://youtu.be/Z9HBGsVqymA

G015(AE)Lesson 1-Power system protection scheme.zip

http://youtu.be/ihpd3cDAhBU

http://youtu.be/EGXkLRM2L9M

http://youtu.be/zOIUYQ7OJfs

G015(AE)Lesson 2-Differential relay.zip

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson_3-Over_current_&_earth_fault_protection.zip

http://youtu.be/hvGjdO9jEhk

G015(AE)Lesson 4-Three phase differential relay.zip

http://youtu.be/2iW0oEScMsw

http://youtu.be/VuzjXkRx4UI

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson 5-Current time grading.zip

http://youtu.be/r0gkLrmkKsM

G015AE Lesson 6

http://youtu.be/InsTLh7_N5k

G015(AE)Lesson_7-CT_PT.zip

http://youtu.be/ZF_y65xsM_M

G015(AE)Lesson 8-Distance relay.zip

http://youtu.be/NKzMVquFLu8

http://www.filefactory.com/file/c386a2e/n/G015_AE_Lesson_8-Distance_relay.zip

G015(AE)Lesson 9-Telecom in power protection.zip

http://youtu.be/9C6ogqZAKRg

http://youtu.be/XRpffA6hU_U

http://youtu.be/X-kz3cyL9fU

G015(AG)Lesson 1-Stability.zip

http://youtu.be/fUyNqcXtBXg

G015(AG)Lesson 2-Generator load sharing.zip

http://youtu.be/A-t7XH4rK4M

http://youtu.be/OTsis_KIRuk

http://youtu.be/8j1nD9nY2hU

G015(AG)Lesson 3-Power Flow.zip

http://youtu.be/0OzT4Pol-Jc

http://youtu.be/fK0wcaTY_rw

G015(AG)Lesson 4-IP based system.zip

http://youtu.be/ve5O8K9fL7k

G015(AG)Lesson 5-Surge in power system.zip

http://youtu.be/6WkezTcOzX4

G015(AG)Lesson 6-CTPT Harmonic filter.zip

http://youtu.be/Uy7q9SsaOYs

G015(AG)Lesson 7-Short circuit in alternator.zip

http://youtu.be/b-46Kvn8kJI

G015(AG)Lesson 8-Corona.zip

http://youtu.be/XYGRAWOqzsc

G015(AG)Lesson 9-Power surge.zip

http://youtu.be/uzFS-otIn-g

http://youtu.be/IsZ_ccy630w

G015(AG)Lesson_10-Static_Var_Compensation.zip

http://youtu.be/y-of5oLojCU

G015(AG)Lesson 11-PF Control+Fuel cell.zip

http://youtu.be/AXbCcoQeLns

G015(AG)Lesson_12-Exercises.zip

http://youtu.be/nRGScOH9aSM

G037+G038+G039 Part 1/2/3+IS69

Page 232 to 270 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power System (2)

G037+G038+G039 Lesson 1-Power Flow.zip

http://youtu.be/mzwGGXRTtvw

G037+G038+G039 Lesson 2-Site Earthing.zip

http://youtu.be/PATkXVBF9kc

http://youtu.be/H4Dj1K238BE

G037+G038+G039 Lesson 3-Power System Control Equipments.zip

http://youtu.be/JJczbYVWOoI

G037+G038+G039 Lesson 4-Auxiliary System+Harmonic.zip

http://youtu.be/5mDNHGFLA0c

G037+G038+G039 Lesson 5-Harmonic.zip

http://youtu.be/n41q4Rmz2p0

http://youtu.be/8CelGV5AElk

G037+G038+G039 Lesson 6-Harmonic Calculation.zip

http://youtu.be/NHSzu6HkOgI

http://youtu.be/fSLrPIC6Mho

G037+G038+G039 Lesson 7-Synchronous Generator Loading.zip

:http://youtu.be/jv1q7Mtq7Gs

http://www.filefactory.com/file/c39be2f/n/G037_G038_G039_Lesson_7-Synchronous_Generator_Loading.zip

G037+G038+G039 Lesson 8-Turbine Control+Power Line Earthing.zip

http://youtu.be/0CvgkmDE3Kw

G037+G038+G039 Lesson 9-Insulator.zip

http://youtu.be/l4jqs8MLBFA

http://youtu.be/TiQezIA9Z-c

G037+G038+G039 Lesson 10-Reliability of Power System.zip

http://youtu.be/tIUk3nc1IxE

G037+G038+G039 Lesson 11-Harmonic Reduction.zip

http://youtu.be/8dYX-11kRcc

http://youtu.be/A684Agej8-w

G037+G038+G039 Lesson 12-Grounding + Power Quality.zip

http://youtu.be/QQPUj3WXJnA

G037+G038+G039 Lesson 13-Power Quality.zip

http://youtu.be/feI7SCb_QTY

http://youtu.be/mcK2YhDsnr0

G037+G038+G039 Lesson 14-Harmonic Model.zip

http://youtu.be/dwWBOq-BsLY

G037+G038+G039 Lesson 15-Harmonic Losses in Transformer.zip

http://youtu.be/mwEJgEEgPVc

http://youtu.be/1A6FY5f5ijM

http://youtu.be/yLiOKy7uJj0

G037+G038+G039 Lesson 16-Reliability Improvement.zip

http://youtu.be/cn-CfDWnUN8

G037+G038+G039 Lesson 17-Preparation for emergency.zip

http://youtu.be/La7Xip8GI2I

G037+G038+G039 Lesson 18-Harmonic problems.zip

http://youtu.be/0Urnkee_

http://youtu.be/zM_Xcwckicw

G037+G038+G039 Lesson 19-Synchronous machine problems.zip

http://youtu.be/Lx2S-NATr20

G037+G038+G039 Lesson 20-Power Generation + Generator Control.zip

http://youtu.be/56Ks8sArQxc

G037+G038+G039 Lesson 21-Turbine Control+ Digital Excitation.zip

http://youtu.be/uCsvv18qKwQ

http://youtu.be/I4vCDI2CZS0

G037+G038+G039 Lesson 22-Power System Protection.zip

http://youtu.be/c6iXRwfCYBU

G037+G038+G039 Lesson 23-Switch Gear.zip

http://youtu.be/DDpbzgNYTiM

http://youtu.be/2cl-nOdBNro

G040 + IS73

Page 271 to 284 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power transformer

G040 Lesson 1 Power transformer rating 1.zip

http://youtu.be/qjWJVQAh_jA

G040 Lesson 1 Power transformer rating 2.zip

http://youtu.be/JonzO8JD-k4

G040 Lesson 2 Open circuit short circuit test.zip

http://youtu.be/Ru-KlKv40OY

G040 Lesson 3 Transformer regulation.zip

http://youtu.be/t6IZMwMj-B4

G040 Lesson 4 Power transformer connection.zip

http://youtu.be/iig8PISDN1I

G040 Lesson 5 Maximum efficiency.zip

http://youtu.be/Qa7l0eHTWTU

G040 Lesson 6 Transformer parallel operation.zip

http://youtu.be/dkRxoaozrOk

http://youtu.be/Sz5QY727w-8

G040 Lesson 7 Harmonic in transformer.zip

http://youtu.be/_YOlWb3e574

G040 Lesson 8 Transformer problem + auto transformer.zip

http://youtu.be/0KCscbCIUjk

G040_Lesson_9_Transformer_rating_cooling_connection_tap_changing.zip

http://youtu.be/d3XHm-wguzQ

http://youtu.be/XwiIkZnKFqQ

http://youtu.be/uOHBk840Bhw

G040 Lesson 10 Phase shift transformer.zip

http://youtu.be/7aWhg9DIoWI

G042+IS71

Transmission Line

G042 Lesson 1-Transmission line introduction.zip

http://youtu.be/DrOOgcKeaL4

G042 Lesson 2-DC Line+Line reflection.zip

http://youtu.be/jvVdecp-clk

G042 Lesson 3-Power line calculation.zip

http://youtu.be/3TgVt67DhvY

http://youtu.be/QT6aqsaM7a0

http://youtu.be/WxjQIkdJjQ8

G042 Lesson 4-Line model+Economic aspect.zip

http://youtu.be/1HRdGZXp_-w

G042 Lesson 5-Time value of money+Line reflection.zip

http://youtu.be/n9mupLQWANY

http://youtu.be/YdfiX2gL-3c

G042 Lesson 6-Line matching+Wave guide.zip

http://youtu.be/1WyP5_Cek40

G042 Lesson 7-Wave guide.zip

http://youtu.be/BuGtjZ3QBXk

http://youtu.be/pftevsnbl0w

G042 Lesson 8-Microstrip line.zip

http://youtu.be/eINq1kKuiec

G042 Lesson 9-Per unit value of line.zip

http://youtu.be/66Y-Lm3EntI

G042 Lesson 10-Line constants.zip

http://youtu.be/2XYnZZ-zXII

G042 Lesson 11-Smith chart.zip

http://youtu.be/dv-NQh4vlrg

http://youtu.be/KfM8XZd9Wqc

http://youtu.be/3NYVQvW8-Nk

http://youtu.be/5qBwLsbtfTA

http://youtu.be/ViamcvqAy_I

http://youtu.be/j_nx9n7mGec

http://youtu.be/d53B3-zV2ec

G042 Lesson 12-Four terminals network.zip

http://youtu.be/HCO4P1qrPbA

G042 Lesson 13-Exercises.zip

http://youtu.be/LeyJf1PhpCY

Power References

http://electricaldiploma2013.zoomshare.com/files/powerreference.htm

Advanced Diploma in Electrical Engineering Exercises

Click HERE

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with IS69 assessment Mapping.pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	**UETTDRIS69A Diagnose and rectify faults in energy supply Apparatus**		

Copy and paste the following table for each element as required

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1.Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, obtained and understood.	Q1,2,3 of IS69 assessment Mapping.pdf (Page 1)		
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed.	Q 4,5,6,7 of IS69 assessment Mapping.pdf (Page 2)		
	1.3	Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel			Advanced Diploma in Electrical Engineering Exercises Page 2 Q8 to 11)
	1.4	The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel			Advanced Diploma in Electrical Engineering Exercises Page 124)Q10,11 Advanced Diploma in

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
					Electrical Engineering Exercises Page 131) Q5 to 15
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site	Advanced Diploma in Electrical Engineering Exercises Page 133) Q23 to 30		
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.			Advanced Diploma in Electrical Engineering Exercises Page 133) Q38 to 43
2.Diagnose and rectify faults	2.1	OHS risk control measures and procedures for carrying out the work are followed.	**As per 1.3**		
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures	Advanced Diploma in Electrical Engineering Exercises Page 126) Q35 to 37		
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures	**As per 1.3**		
	2.4	Logical diagnostic methods are applied to diagnose energy supply apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.			Advanced Diploma in Electrical Engineering

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
					Exercises Page 128) Q57 to 60
	2.5	Suspected fault scenarios are tested as being the source of system problems	Q24,25 of IS69 assessment Mapping.pdf (Page 9+10)		
	2.6	Cause of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system			Advanced Diploma in Electrical Engineering Exercises Page 131)Q14 to 16
	2.7	Faults in the apparatus components are rectified to raise energy supply apparatus to its operation standard.			Advanced Diploma in Electrical Engineering Exercises Page 132) Q19 to 21
	2.8	Apparatus is tested to verify that it operates as intended and to specified requirements	Advanced Diploma in Electrical Engineering Exercises Page 134) Q45,46		
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements	**As per 1.3**		
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.			Advanced Diploma in Electrical Engineering Exercises Page 211) Q50 to 54
	2.11	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or			Advanced Diploma in

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
		damage to apparatus and the surrounding environment or services and using sustainable energy practices.			Electrical Engineering Exercises Page 128) Q54 to 59
3.Complete and report fault diagnosis and rectification activities	3.1	OHS work completion risk control measures and procedures are followed.	**As per 1.3**		
	3.2	Work site is made safe in accordance with established safety procedures.	**As per 1.3**		
	3.3	Rectification of faults is documented in accordance with established procedures.	Test 1 All Questions		
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified	Test 2 All Questions		

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Receiving end voltage comparison between short/ medium and long transmission lines		EP1	
Long transmission line PI equivalent circuit		EP2	
Long transmission line T equivalent circuit		EP3	

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Transmission line efficiency/ Transformer effect on line efficiency		EP4	
Reactive power and power factor improvement		EP5	
PF effect on line current		EP6	
Corona Video		EP7	
Phase sequence measurement		EP8	
Underground cable capacitance test		EP19	
High tension line design		EP20	
Line insulator test & capacitance grading		EP21	
Voltage profile chart of distribution system		EP22	
Load centre-Power loss comparison		EP23	

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 Control of voltage encompassing			Advanced Diploma in Electrical Engineering Exercises Page 122) Q40 ,43,44
T2 The importance of the location in the system of voltage control devices			Advanced Diploma in Electrical Engineering Exercises Page 122) Q41,42
T3 The use of graphical methods to calculate the size of VAr regulating plant			Advanced Diploma in Electrical Engineering Exercises Page 132) Q19 to 21

Add rows to the following table as required

Assessment Conditions	Assessment event 1 Written Test	Assessment event 2 Practical &	Assessment event 3 Assignment

		Observation	
T4 Control of power			Advanced Diploma in Electrical Engineering Exercises Page 133) Q23 to 30
T5 The relationship between power and frequency			Advanced Diploma in Electrical Engineering Exercises Page 130) Q1,2,3,4
T6 Types of communication systems			Advanced Diploma in Electrical Engineering Exercises Page 133) Q23 to 30
T7 Transient over-voltages in power systems			Advanced Diploma in Electrical Engineering Exercises Page 133) Q40
T8 Factors leading to the generation of corona			Advanced Diploma in Electrical Engineering Exercises Page 131) Q5 to 10
T9 Power System Protection			Advanced Diploma in Electrical Engineering Exercises Page 133) Q 38 to 43

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UETTDRIS69A Diagnose and rectify faults in energy supply Apparatus

1 Prepare to diagnose and rectify faults

1.1 OHS procedures for a given work area are identified, obtained and understood.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q15+16

www.electricaldiploma2013.webs.com Then access Click **HERE** to download the Exercises

http://www.mongroupsydney1.com/Advanced_Diploma_in_Electrical_Engineering_Exercises_EE011.pdf

Relevant Instruction Lessons

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

Q1.Describe the risks and dangers in power station and outline the recommended safety
Q2.equipments and emergency procedures.
Q3.Outline the process of maintenance work in substation.

1.1 OHS risk control measures and procedures in preparation for the work are followed

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q17+18 Page 4 Q21+22

Q4. Write down the check list to perform the tasks in substation.
Q5. Write down the safety procedures and methods to assess the risk and to reduce the risk.
Q6..Write down the code of practice for working near exposed main and apparatus.
Q7.Which precautions are to be emphasized when working in substation?

1.3 The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)

Q8. Write down the risk reduction procedures in maintenance work to discuss with work manager. (Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)

1.2 Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.

1.3 Safety hazards which have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.

Answer the following questions to seek the advice from work supervisor in the following aspects.
Q9. What are the risks?
Q10.How are the risks classified?
Q12.How can the risk be evaluated?
Q12.How will you manage the risk? Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q8 to 11)

1.4 The extent of faults is determined from reports and other documentation and fro discussion with appropriate personnel

Ref-Advanced Diploma in Electrical Engineering Exercises Page 124)

The following questions are developed to assess the fault.

(17) Power transformer protection
Slide 1+3

Q10.What are the types of faults in power transformer?
Slide 2

Q11.Wat are the causes of transformer faults.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 131)

(35) Corona+ short circuit current+ Transient fault + voltage surge+ Reflection
Slide 1
Q5.What is corona?
Q6.Explain the concept of disruptive critical voltage.
Slide 2+3
131
Q7.How does corona happen? And express the factors related to occurance of corona.
Slide 4
Q8.Write the formula to calculate break down voltage
Slide 5
Q9.What are the disadvantages of corona?
Slide 6+7
Q10.What are to be done to prevent the corona?
Slide 8
Q11.Sketch the short circuit current in AC network.
Slide 10
Q12.Sketch the connection of current limiting reactor.
Slide 11

Q13.Sketch the power response by line voltage surge graph.
Slide 12
Q14.What are the causes of voltage surge?
Q15.Write the equation for switching e.m.f velocity.

1.5 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site

Ref-Advanced Diploma in Electrical Engineering Exercises Page 133)

The practice questions are organized to find out the protection system equipments and materials together with relevant theory
(38)Computerised control + Supervisory control+ IP based network + Digital control
Slide 1
Q23.Explain the application of telecom system in power line with sketch.
Slide 2+4+5
Q24.Explain telecom based differential protection system.
Slide 6
Q25.Explain distributed real time computer network for power system.
Slide 7+8+9
Q26.Explain remote and computer control in power system.
Slide 10.
Q27.Why is phase comparison relaying provided?
Q28.Sketch ADC control.
133
Slide 11+12+13+14
Q29.Sketch internal & external fault discrimination diagram.
Slide 15+16
Q30.Explain the application of computerised control and power network.

1.6 Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety

Ref-Advanced Diploma in Electrical Engineering Exercises Page 133)

(39) Metering + Location of CT+ Power Surge +Grounding +Harmonic
Slide 1
Q38.Sketch the basic metering arrangement in substation.
Slide 9
Q39.Sketch the location of CT in power line
Slide 10
Q40.Explain power surge protection for transmission line.
Slide 11+12
134
Q41.Explain grounding in power system.
Slide 13+14+15
Q42.A square wave has amplitude of 70V , fundamental is 90V. Calculate (a) Effective value of square wave. (b) Effective value of fundamental (c) Total harmonic distortion
Slide 6
Q43.Sketch the diagram of harmonic filter.

2 Diagnose and rectify faults

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/IS67 Assessment 2 /Question Marking scheme IS69 is assessed concurrently with IS67 Assessment 2 Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/IS67 Assessment 2/ Assessment Cover Sheet IS69 is assessed concurrently with IS67 Assessment 2 Record2016/Students/TAFE/Sem 1-2016/Sem1 2016

		Students work Assessment 2/IS67 Assessment 2/ Assessment Feedback Sheet IS69 is assessed concurrently with IS67 Assessment 2
Students' work in own record	Summative Assessment- Formal Tests	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 2 / Student Work IS69 is assessed concurrently with IS67 Assessment 2
	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS67 Assessment 1 / Student Work IS69 is assessed concurrently with IS67 Assessment 1 Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 2016 Attendance Records+Record Book

2.1 OHS risk control measures and procedures for carrying out the work are followed.

As per 1.1 to 1.3

2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 126)

Live testing of protective relay system and depermination of characteristics and relevant questions are arrrranged to provide this competency component.

Slide 21

Q35.Sketch the typical protection scheme

Slide 22

Q36.Sketch the computer flow chart for power system protection.

Slide 23

Q37.Sketch electronic control system for power system protection.

2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures

As per 1.3

2.4 Logical diagnostic methods are applied to diagnose energy supply apparatus faults employing measurements and estimations of system operating parameters referenced to system operational requirements.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 128)

Slide 5
Q57.Explain busbar protection with sketch
Slide 6
Q58.Write line & busbar protection with sketch.
Slide 7
Q59.Sketch the operation of digital relay.
Slide 8+9
Q60.Sketch the flow chart for the software of digital protective relay.

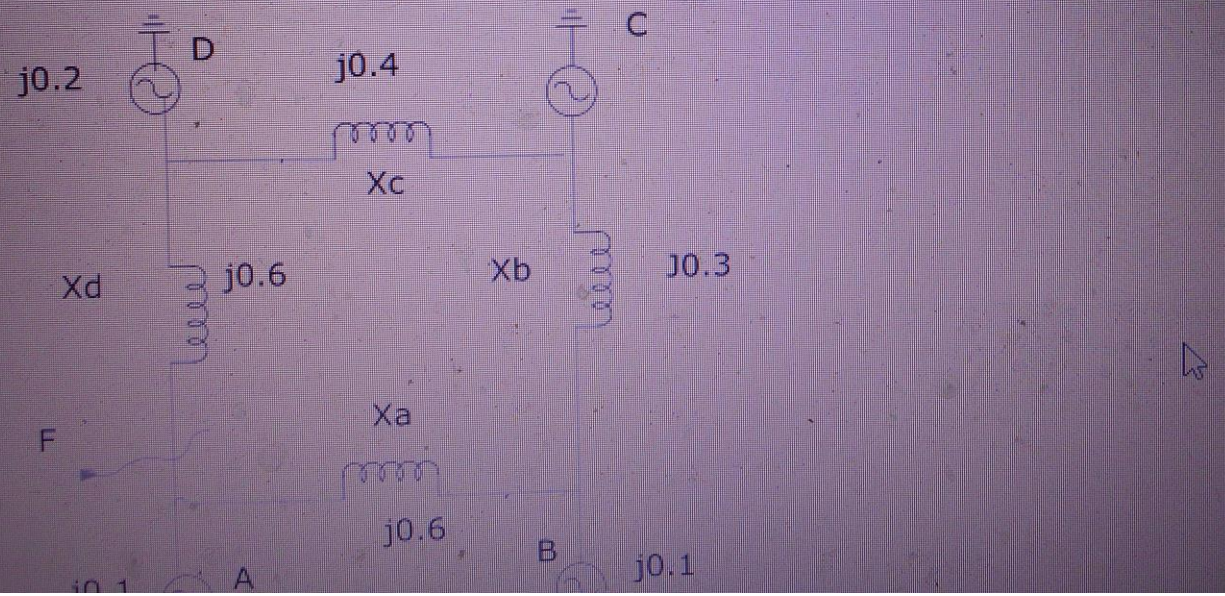
Ref-Advanced Diploma in Electrical Engineering Exercises Page 130)
Slide 7
Q4.Write the machine angular acceleration formula

2.5 Suspected fault scenarios are tested as being the source of system problems..
Ref-Advanced Diploma in Electrical Engineering Exercises Page 204/205)

(12) Per unit system

Slide 1+2+3+4+5+6

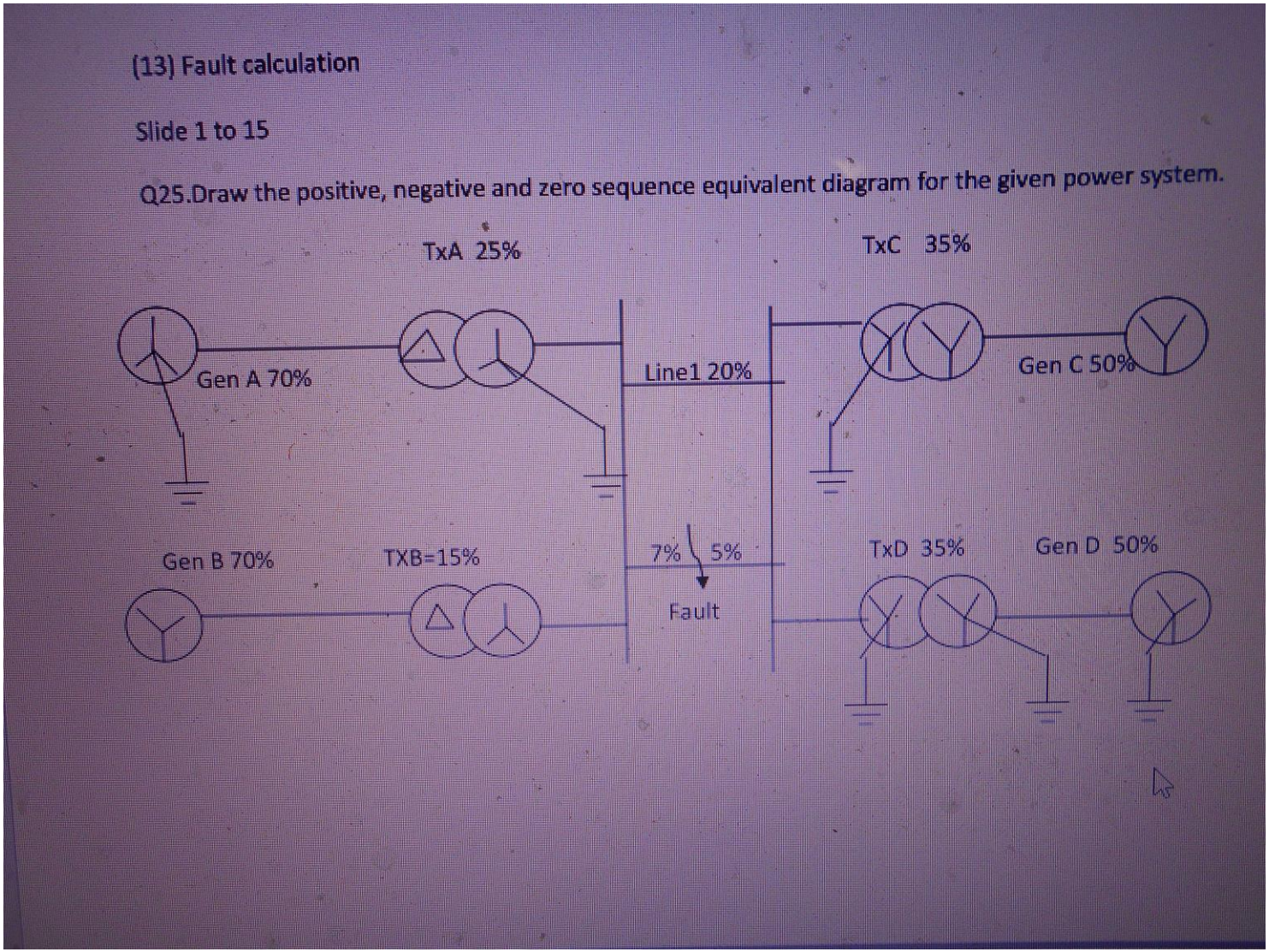
Q24.In the given network, three phase fault occurs at point F . Calculate fault MVA per unit value of reactance. All refer to 200MVA base , resistance may be neglected.



(13) Fault calculation

Slide 1 to 15

Q25.Draw the positive, negative and zero sequence equivalent diagram for the given power system.



2.6 Cause of the faults are identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system

Ref-Advanced Diploma in Electrical Engineering Exercises Page 131)

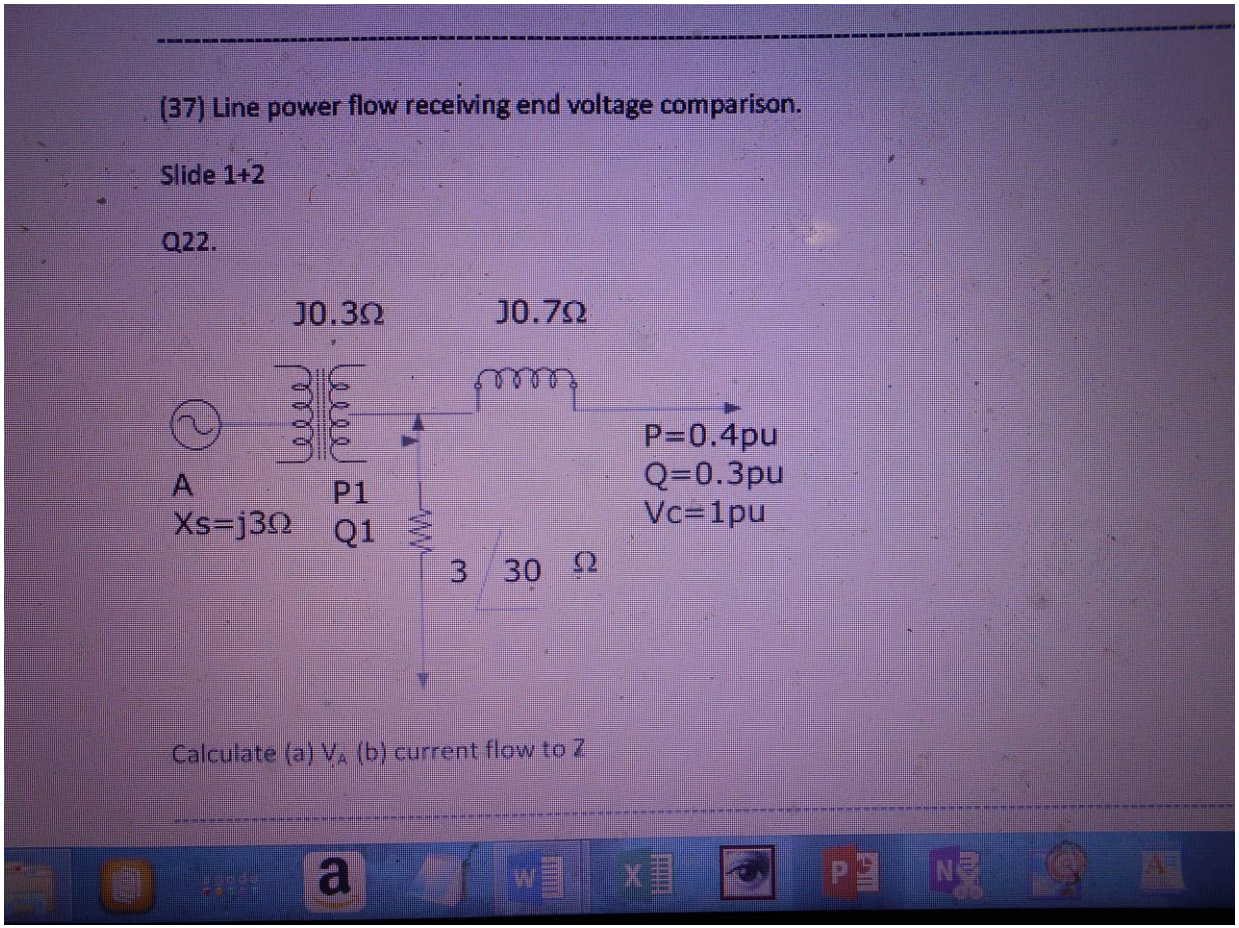
Slide 12

Q14.What are the causes of voltage surge?

Q15.Write the equation for switching e.m.f velocity.
Slide 13
Q16.Sketch voltage surge & protection diagram .

2.7 Faults in the apparatus components are rectified to raise energy supply apparatus to its operation standard.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 132)

(36) Reactive power control static VAR compensation
Slide 1+2+3
132
Q19.How will you connect the reactive power control capacitor bank to three phase system.
Q20.Sketch synchronous motor reactive power control diagram.
Q21.Explain how reactive power is controlled by static VAR compensation system.



2.8 Apparatus is tested to verify that it operates as intended and to specified requirements

Ref-Advanced Diploma in Electrical Engineering Exercises Page 134)

Slide 4
Q45.Sketch (a) Arcing horn (b) Lightning arrester (c) Surge absorber
Slide 5

Q46.Sketch the arrangement of instrument in sub station.

2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.

As per 1.3

2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 211)

(11) Change control
Slide 1
Q50.Describe the overview of change control system.
Slide 2
Q51.Explain the establishment of contracts
Slide 3
Q52.Outline the project control system responding the disturbances.
Slide 4
Q53.Sketch the procedure for preparing quality manual.
Slide 5+6
Q54.Explain management leadership.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 130)

Original design
Q1.Generator A with 100MW, 4% drop and generator B of 200 MW 4% drop. Are supplying the 200MW load. Calculate their load share.

But in reality, the situation is changed to

Q2.Generator A with 200MW 6% drop and generator B with 400MW 7% drop are supplying 300MW load , calculate their load share.

Provide the solution

2.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices

Ref-Advanced Diploma in Electrical Engineering Exercises Page 128)

To convert the analog relaying system to digital relay system, the dismantling of origin components and assembly of new system components are to be done. The following questions and activities provide this competency component.

(29) Digital relay+ Telecommunication for protection

Slide 1

Q54.What is digital relay?

Slide 2+4

Q55.Sketch the flow diagram of digital relay operation.

Slide 3+4

Q56.Sketch DAC system

Slide 5

Q57.Explain busbar protection with sketch

Slide 6

Q58.Write line & busbar protection with sketch.

Slide 7

Q59.Sketch the operation of digital relay.

Location of Evidences (Table 1)

3 Complete and report fault diagnosis and rectification activities

3.1 OHS work completion risk control measures and procedures are followed.

As per 1.3

3.2 Work site is made safe in accordance with established safety procedures.

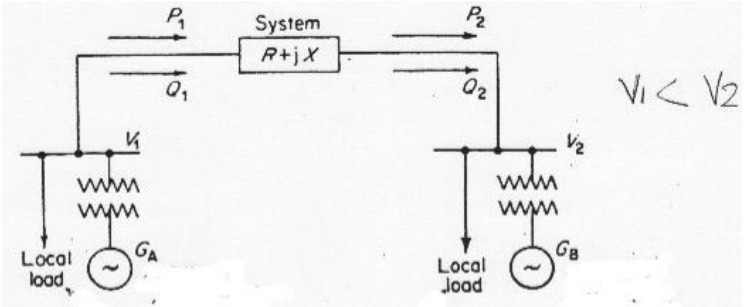
As per 1.3

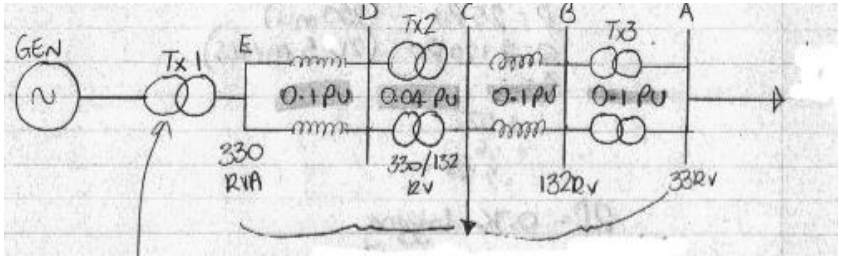
3.3 Rectification of faults is documented in accordance with established procedures.

3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified

Assessment Criteria	Question No	Questions
KS01-TIS69A Electrical power system operations Evidence shall show an understanding of electrical power system operations to an extent indicated by the following aspects: T1 Control of voltage encompassing: ⍰ Conditions leading to voltage collapse and system disintegration. ⍰ Effects on the system of high/low volts ⍰ Voltage control devices - voltage regulators applied to generators and synchronous phase modifiers, electromagnetic voltage regulators, series and parallel capacitors, OLTC transformers and static Var compensations (SVCs) such as saturated reactor compensations (SRs), thyristor controlled reactor compensators (TCRs), combined TCR/TSCs and the production of wave-form distorting harmonics and control devices. T2 The importance of the location in the system of voltage control devices. T3 The use of graphical methods to calculate the size of VAr regulating plant.	1 SCT 1 2 SCT 1 3 SCT 1 4 SCT 1 5 SCT 1 6 SCT 1	What are the major divisions of electricity supply system.? (5 marks) Sketch the schematic diagram of a hydro power generation system. (5 marks) Define the followings • Base load • Peak load (5 marks) Sketch the winding diagram for stator winding of following 3 phase aletrnator. 3 phase, 4 poles, 50HZ, (15 marks) An alternator has the following single phase equivalent values. E0= 22kv Et = 24kv Xs=2 ohm E0 leads Et by 20 degree. (a) Calculate the total real power output of the alternator (b) Draw a single phase phasor diagram. (10 marks) Sketch the phasor diagram of a synchronous generator for the following loads.

	8 Total 60 marks	Lagging power factor , Leading power factor, Unity power factor (10 marks) Explain the complete turboalternator control system with sketch. (10 marks)

Assessment Criteria	Question No	Questions
T4 Control of power encompassing: - Base load and spinning reserve - Regulating machines - Rapid start plant, - Phase shifting transformers and various forms of load shedding. - Principles and practices of automated control of individual machines - Stations and transmission/tie-line elements. - Synchronising power T5 The relationship between power and frequency encompassing:	1	Find the real power supplied by Generator A and Generator B 

⍰ Limiting values ⍰ Machine stabilising - steam by-pass, rapid valving, slip stabilisers and over speed limiting. ⍰ Use of single pole generator CB's. ⍰ Use of machine AVR's as angular stabilisers. ⍰ Damped and un-damped system oscillations. ⍰ Relationship between fault clearance times and system stability. ⍰ Calculation of critical clearance angles based on equal area criteria.	2 3 4 5 Total 40 marks	GA- Generator A 200MW 6% Drop GB- Generator B 400MW 7% Drop (10 marks)  Generator TX/330kv Load 300MW 0.9PF Lagg Base 100MVA In above diagram, what total MW and MVAR must the generator supply and at what power factor? (10 marks) Sketch power angle curve of synchronous machine. (5 marks) Explain how reactive power is controlled by using Static Var Compensation system (10 marks) How will you connect reactive power control capacitor bank to 3 phase power supply system? (5 marks)

Assessment Criteria	Question No	Questions

T6 Types of communication systems encompassing:

- Telephone, power line carrier, dedicated cable, microwave links and fibre optics.
- Quantities and signals to be communicated.
- Advantages and disadvantages of the various systems.
- Equipment requirements.

T7 Transient over-voltages in power systems encompassing:

- Switching and lightning overvoltages and their effect on different plant items.
- Transient over-voltage control and reduction using surge diverters, shield wires and CB are control.
- Insulation systems, insulation coordination, insulation grading in plant items, bushings and capacitor bushings.

T8 Factors leading to the generation of corona encompassing:

- Consequences of corona.
- Reduction of corona
- Conductor bundling, grading rings and conductor surface treatment.

T9 Power System Protection encompassing:

- Location of CT's in major plant items.
- Earthing principles and devices.
- Fault current control/limitation using neutral earthing compensators (NEC's), neutral point earth impedances, high conductivity shield wires and parallel feed interlocking.
- Application of different types of protection.

1 An alternator has a six pole rotor rotating at 3000 rpm. Calculate the frequency of the induced voltages in the stator winding. (5marks)

2 Why are EHV and HV lines used for power transmission? (5 marks)

3 Why transformers are used in the transmission system? (5 marks)

4 (10 marks)

QUESTION 1.

Briefly explain how the Real Power in watts and Reactive Power in Vars delivered by a Turbo-alternator are controlled.

Over . under excitation

5 (15 marks)

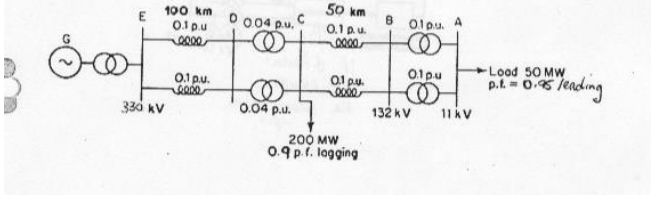
QUESTION 5

Refer to the interconnected power system shown below.

a) Calculate the reactive power absorbed or generated by the system (excluding loads).

b) Calculate the value of Vars to be injected at each point on the system to [illegible] replace the system Var requirement and to minimise the Vars supplied/absorbed by the generator.

base ref 100MA



6 (10

QUESTION 1.

Explain how vibrations may be set up in overhead conductors of a high voltage transmission line and how their effects may be reduced.

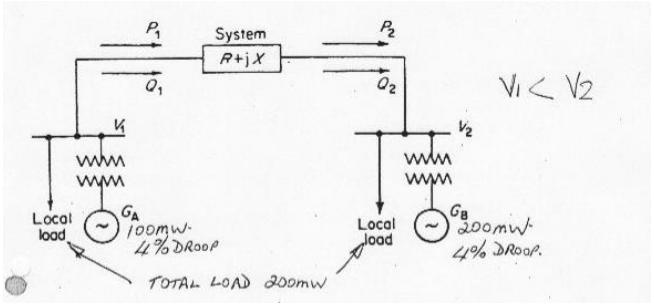
P3 - P4

QUESTION 2.

A transmission line has a span of 200 metres between level supports. The conductor has a weight of 10 N/m and the tension in the conductor is 11.5kN.

Calculate the midpoint vertical sag of the conductor.

$S = \frac{wL^2}{8T}$ (Ans: 4.34m)

	marks) 7 (10 marks) 8 (10 marks) 9 (10 marks) 10 (10 marks)	**QUESTION 5** Briefly describe how the capacitance of a transmission line can produce a power factor correcting effect and cause a rise in voltage along a lightly loaded line. **QUESTION 6.** Describe the difference between solid paper and oil insulated high voltage cables. **QUESTION 7** An alternator connected to an infinite busbar, has the following single phase equivalent values: $E_O = 20kV$ $E_T = 23kV$ $X_S = 2\Omega$ E_O leads E_T by 25°. a) Calculate the total "ACTIVE" power output of the alternator. b) Draw a phasor diagram for one phase of the alternator. (Ans: 291.6MW)  How is 200MW load shared by two machines?

	11 (10 marks) Total 100 marks	

Work performance + Practical Instruction Back up

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Refer Power System Practicals

Part 1: Operational Study

Lab No	Name of Practical	Equipments	Assessment
	Group 1 Power & Line		
EP1	Receiving end voltage comparison between	distribution system	Circuit interpretation, connection, data collection, calculation, graph

	short/ medium and long transmission lines	types	sketch, report presentation, conclusion
EP2	Long transmission line PI equivalent circuit	overhead systems	As above
EP3	Long transmission line T equivalent circuit	distribution system types	As above
EP4	Transmission line efficiency/ Transformer effect on line efficiency	energy metering • demand meters	As above
EP5	Reactive power and power factor improvement	energy metering • demand meters	As above
EP6	PF effect on line current	energy metering • demand meters	As above
EP7	Corona Video	• surge protection	Report presentation, conclusion
EP8	Phase sequence measurement		Competency assessment
	GROUP 2- Protection equipments		
EP9	Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply)	protection equipment and systems	Competency assessment
EP10	Current transformer & potential transformer connection & ratio test	current transformers • potential transformers	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP11	Over current relay characteristics	protection equipment and systems • over-current protection	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP12	Electronic relay test	conventional relays • electronic relays	As above
EP13	Study of various protective relays used in industry through trade references	• earth fault protection • differential	Research, report presentation

		protection busbar protection • surge protection • conventional relays	
	Group 3- Supply System		
EP19	Underground cable capacitance test	underground systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP20	High tension line design	• overhead systems	Design project
EP21	Line insulator test & capacitance grading	• overhead systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP22	Voltage profile chart of distribution system	• voltage regulation equipment • on load tap changers	As above
EP23	Load centre-Power loss comparison	• distributor equipment	As above
EP30	Transformer polarity test	• distributor equipment	As above
EP42	Maximum power transfer theorem with power circuit	• load control	As above
EP43	Load flow study	• load control	As above
EP45	Trade reference study, switch board, busbar, insulator, circuit breakers	reclosers / sectionalisers.	As above

2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

2.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to system and the surrounding environment or services and using sustainable energy practices.

General faults including: open-circuit; short-circuit; incorrect connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure for the equipments in the range

(2)**Explore some of the faults in power system/ energy supply that can be rectified only by utilizing para-professional knowledge background and how the arranged simulated practical can provide the hand on experience and work performance for the students and how it is different from the performance only based on trade level activities.**

In range of performance, it outlines the real equipments used in the industry. There will be the arguments that the setting of practical in lab room only includes rheostat, resistor, varic, capacitor etc. How it meets the outlined competencies?
To exactly find out and rectify the faults in energy supply system , the tasks and complexity level more than the trade level- (check the continuity, check the connection, visual inspection, testing and measurement)will be included.
The following is the various power system faults which I draw out from my power engineer work records that the technical knowledge higher than trade level is required to successfully rectify the fault and determine the appropriate solutions. In the table, I summarize how the fault is , caused, background theory, how the person who knows the theory will do, how the person who does not know the theory will do and how my simulated practical / and practical related background theory will assist to develop the fault finding skill.

Typical fault	Cause	Related Theory	How the person who does not know the theory will do	How the person who knows theory will do	Name of simulated practical	How to develop the skill
(1)In reticulation system, there is abnormally different in voltages	Abnormal resistance. Wrong cable selection. Abnormal circuit configuration	Voltage profile chart.	May give he other idea to change the load	Measure voltage, sketch the voltage profile chart. Then identify the portion of the circuit.	EP 23 Voltage profile chart	Develop the analytical skills to identify the fault point
(2)Line conductor slips from the pin insulator	Line deviation is too high, combination of wind, conductor tension will take away the conductor from pin insulator	Line deviation angle calculation	Will reinstall the line. After some period, he same thing will happen again	Will examine line deviation angle. Tension, wind force. Will rearrange the line or provide shackle insulator	Theory instruction. Line deviation	Develop the problem solving skill on line construction.
(3)Conductor sag too low. Hit by	Sag calculation. Wrong tension,	Sag/ line design	Pull up the cable. After some time, it	Will examine the related parameters and find the	EP 20 High Tension Line Design	Develop the skill on line design and to know the

traffic and then broken	safety factor, weight		will fall again	way		technical factors for sag.
(4)Discharge current flows out from underground insulator and cause the injury	UG cable capacitance. Charging current	UG Cable capacitance test	Will think about current flow, leakage etc.	Will examine the UG cable capacitance and produce the procedure for discharging	EP 19 Underground cable capacitance test	Develop the skill in UG cable testing focus on capacitance and estimate the amount of charging current
(5)Line pole broken without natural disaster	In appropriate pole strength	Pole mechanical design	Will erect the pole. Some time after, broken gain	Will examine he tension, wind force, conductor weight, then will calculate the pole strength and select appropriate diameter of pole and appropriate pole material	Pole mechanical design lesson + EP 20 High tension line design	Develop the skill on line design and to know the technical factors for pole.

2 Complete and report fault diagnosis and rectification activities.

3.1 OHS work completion risk control measures and procedures are followed.

3.2 Work site is made safe in accordance with established safety procedures.

As per 1.3

3.3 Rectification of faults is documented in accordance with established procedures.

3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Fault	**Reason**	**Related theory**	**The person who does not know the theory will do**	**The person who knows the theory will do**	**Related Practical**	**Development of skill**
(6)There are too much power loss. Line efficiency is poor	If all connected loads are all right, wrong location of power station/ load centre	Load centre study	Will not take account on load centre	Will take account on load centre	EP23 Load centre power loss comparison	How the location of supply source affect line losses/ efficiency and % voltage regulation
(7)Problem with UG	Wrong method in UG	UG cable joining			UG cable joining	UG cable joining

cable joint	cable joining	methods. Theory study			method in my prepared 7762 AA Electrical Distribution textbook	methods. Theory PLUS photographs
(8)Generator got motor action. Reverse power relay cuts off	Out of synchronism. Up to 180 degree out of phase	Synchronizing	Will neglect synchronism. Just run and switch on	Will focus on synchronizing process. Avoid reverse power relay operation	Synchronizing	Synchronism, generator parallel operation requirement practical knowledge development.
(9)Generator vibration/ hunting	Stability concept	System stability	Do not care on machine hunting. Will continue to run . As consequence, face the short life of bearing/ shaft	Will take care on transient and steady state system stability and prevent the hunting	Moment of inertia/ machine stability	Moment of inertia/ machine stability practical knowledge development.
(10)Relay operates on fault. But the system loss the synchronism	System stability/ critical fault clearing angle aspect.	System stability/ critical fault clearing angle	Do not care on the relay setting to provide both fault protection and maintain the system stability. Re-synchronize the generators when ever the relay operates	Will set the proper relay setting to maintain the stability	Critical fault clearing angle. Equal area criteria	Critical fault clearing angle. Equal area criteria practical knowledge development.
(11) Line reactive power too much. The equipment capacity is unnecessarily increased	Problem related to load flow	Load flow study	Will not take account on load flow concept.	Take account on load flow and optimize the loading	EP 42 Maximum power transfer theorem EP43 Load flow study	Develop the load flow concept and practical optimizing skill
(12)There is nothing wrong with the line but the transformer placed near the switch heat up and cooked	Switching surge	Switching voltage surge	Just replace the transformer. After some time, the same problem will be faced	Take account on switching voltage surge and plan tom install the surge diverter.	Switching voltage surge	Switching voltage surge practical knowledge development.
(13)Light radiated from the power line. Too much power loss and high interference to telecom line	Corona	Corona study	Will consider the ACT OF GOD	Will find the way to reduce corona such as application of hollow conductor to increase diameter of conductor to raise the critical voltage level	EP 7 Corona video	How corona occurs and find the way to prevent .
(14) Control telecommunication for power line down, no	Application of telecommunication system in power	Application of telecommunication system in power	Will not be aware of the role of telecommunication	Will check the function of telecom equipment for power system	Application of telecommunication system in power	Web based control/ IP based control and telecomm: concepts

relay operates	system operation	system operation 7762AG Power System Operation	system	control and protection and perform the preventive maintenance	system operation	practical knowledge development.
(15)Too much flickering of lamps	Harmonics	Harmonics in power system	Will not know what happens	Will check the harmonics source/ increase the size of neutral wire to allow the harmonics current flows	Harmonic source scope observation	Development of identifying the harmonics
(16)Lightning strike	Lightning arrester	Lightning arrester	Will reinstall LA. But not sure it will be safe or not.	Will check the coverage provided by lightning arrester	Lightning arrester study	Lightning arrester practical knowledge development.
(17)Earth fault/ earth leakage can not be protected	Grounding in power system	Grounding in power system 7762AE Power System Protection	--	Will measure the ground resistance, will implement the additional ground connections	Power system grounding study	Power system grounding practical knowledge development.
(18)Occurance of over current	Over current protection	Over current relay 7762AE Power System Protection	Will not exactly know how to set/ adjust the over current relay	Will set/ adjust the over current relay	EP11 Over current relay characteristics	Practical skill development in over current relay
(19)Earth leakage fault	Earth leakage protection	Earth leakage protection 7762AE Power System Protection	Will not exactly know how to set/ adjust the earth leakage relay	Will set/ adjust the earth leakage relay/ CT arrangement	CT arrangement for earth leakage fault & fault in protected zone	Practical skill development in earth leakage fault protection
(20)Transformer protection	Differential relay	Differential relay	Will not exactly know how to set/ adjust the differential relay	Will set/ adjust the differential relay	CT arrangement for fault in protected zone	Practical skill development in differential protection
(21)Line is protected by differential/ over current relay. But it is not effective when the load are fed from some part of the line	Distance relay	Distance relay	Will not exactly determine the reason why and how to change the protection system	Will change the protection system and will calculate earth fault impedance	Earth fault calculation	Problem solving skill development in earth fault calculation
(22)Fault happens but the relay can not provide the effective protection	CT/ PT ratio for relay	Relay protection scheme	Will not exactly determine the reason why and how to change the protection system	Will adjust CT PT ratio at the simulated fault situation and will adjust the relay setting appropriately	EP9 Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency	Practical skill development in CT PT ratio adjustment

					development without electrical supply) EP10 Current transformer & potential transformer connection & ratio test	
(23) I accidently open the CT secondary and it got explosion	Current transformer	Current transformer		Will make sure not to open circuit the CT secondary	EP10 Current transformer & potential transformer connection & ratio test	Develop the skill on CT/ PT connection & applications.
(24) we use old type gravity relay, it does not provide the effective protection	Restrainting system of relay	Relay types & characteristics		Will make sure to correctly arrange the relay position	EP13 Study of various protective relays used in industry through trade references	Knowledge development on various protective relays used in industry through trade references
(25) Relay operates at wrong current	Operation/ setting of relay	Relay types & characteristics	Trial error approach will be used	Will make sure to correctly arrange the relay setting	EP11 Over current relay characteristics	Practical skill development in over current relay
(26)In power transformer protection. Transformer is Star/Delta connection. All relay settings are correct. But relay wrongly operates. I checked all continuity. Every thing all right	Transformer Star Delta & relay star/delta matching	Star delta vector diagram. Transformer star side –Relay delta & transformer delta—Relay star	Will not know what happens and how to rectify the fault	Will check the connection and will consider the vector difference causes the wrong operation	EP10-CT & PT connection/ ratio check	Practical skill development in CT/PT Connection
(27)Regulator is set to meet the system voltage condition. But later time, it is blown out	Voltage ratio/ regulator setting	Voltage regulator	Will emphasize in solving the problem for a short moment. Will not consider the long term impact	Will consider whether the setting to upgrade the voltage will impact on future system voltage	EP22 Voltage profile chart of distribution system	The skill training to develop the judgment of voltage level and future impact

				change		
(28)Fault spread from one busbar to another busbar	Busbar arrangement/ sectionalization	Busbar arrangement	Will assemble he busbar to install the equipment, will not consider how the arrangement can contribute the spread of fault	Will consider the way to insert section circuit breakers	Busbar layout/ arrangement study	Busbar arrangement sketch/ plan practice development
(29)Equipment suffers over voltage and blown out after the capacitor value is changed for PF improvement	Inappropriate capacitor setting. Cause of overvoltage. Vector diagram	PF improvement/ Capacitive reactance effect on load	Will only see the way to improvement the PF. Will not know the consequences	Will posses the knowledge of capacitor impact on load voltage and will take account on optimal setting of capacitor value	EP5-capactance effect on line EP6-PF Improvement	PF improvement method is judgment with capacitor effect causes over voltage. This skill is trained.
(30)Directional relay does not work to protect the reverse power flow	Directional relay operation	Study on directional relay.		Wrong connection to direction coil will be identified	EP 13 Protective relays used in industry	Guide to acquire the relevant technical knowledge
(31)Voltage flashing over capacitor string	Capacitor string	Study on capacitor string	Will change the capacitor string	Will provide the preventive protection such as arcing horns OR take account on line capacitor grading	EP21 Line insulator capacitance test	Develop the skill to measure line capacitor value . Capacitance grading.
(32)Circuit Breaker itself is blown out	Circuit Breaker capacity	Study on capacity of circuit breaker	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault	EP13 Relay & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(33)CB too hot and meltdown	CB capacity/ Arc development	Study on capacity of circuit breaker/electric arc	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault Will consider the arc extinguishing methods	EP13 Rely & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(34)Need to expand the line in emergency. I am only in-charge	Line design	Line design project	Will not know how to design a line	Will utilize references/ methods to design and construct the line	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(35)HV current flows into LV line	Separation between HV & LV line	Rules & regulations related to line	Will not know the regulation	Will apply the regulation in real wok	7762AA Line pole/ cross arm design and conductor arrangement	Line electrical & mechanical design practice development
(36) Line wire fracture	Sag calculation	Sag calculation/ minimum cable size	Reinstall the line wire. Like part to like part	Will consider allowable tension/	7762AA Project-Over head line design	Line electrical & mechanical design

			replacement is applied, will use the same size of cable. After sometime, line will break gain	minimum conductor size		practice development
(37)Electronics equipment used for line protection is blown up	Voltage surge	Signal condition sub system. Surge filter	Will replace the electronic board. But the same fault happens again	Will consider the cause of surge. Surge filter / absorber/ diverter will be installed	7762AE Line surge/ application of electronic control system	Develop the skill in line surge/ electronic control.
(38) Receiving end voltage is greater than the sending end	Capacitance effect on long line	Long line 7762AG Power System Operation	Will think that the equipments are designed to operate at the sending end voltage level, it will be enough	Will consider the line configuration and will provide the appropriate arrangement for over voltage caused by capacitance effect on long line.	EP2/EP3 Long Line PI & TEE equivalent circuits	Develop the practical skill in determination of possible voltage rise in simulated line model.
(39)Can not run the generators in parallel	Synchronism problem	Synchronizing	Will not properly know the synchronism	Will consider the synchronism	Alternator parallel operation- Procedure	Develop he knowledge in synchronizing
(40) Over current relay is provided to protect the system but it does not work when the ground fault occurs	Characteristics of relays	Relay types and characteristics	Will think that one relay will protect everything	Will select the appropriate relay for appropriate place and protection task	EP13 Study of various protective relays used in industry through trade references	Knowledge development on various protective relays used in industry through trade references

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1		X	
1.2		X	

1.3		X	X
1.4		X	X
1.5		X	X
1.6		X	X
2.1		X	
2.2		X	X
2.3		X	X
2.4		X	X
2.5		X	X
2.6		X	X
2.7		X	X
2.8		X	X
2.9		X	X
2.10		X	X
2.11		X	X
2.12		X	X
3.1	X	X	
3.2	X		
3.3	X		
EKAS Assessment		X	X

Method of delivery	**Method of collection of evidence**
7-Face to face 6-Electronic **<u>Key for delivery mode</u>** 1-On the job 2-Simulated 3-Blended 4-Self paced 5-Distance 6-Electronic 7-Face to face 8-Other	A,B,D,E,F,G,L Key for Methods for Collecting Evidence: A-Assignment B-Written Task C-Role play D-Exam E-Oral questioning F-Simulation

Detailed explanation Face to face class teaching + Online supplement multimedia notes **Evidence** **Part 1- Evidence of teaching & learning** **Plan for concurrently delivery** www.powerlearning1.zoomshare.com Both digitised notes + multimedia notes including audio files Notes in USB (Available on request) **Part 2- Evidence of lesson planning** (1) Delivery & assessment matrix excel form (2) Semester plan (3) Students study progress plan (Available on request)	G-Observation H-Work based I-Portfolio J-Self assessment K-Case study L-Practical demonstration M-Project N-Training Record O-Other Detailed explanation A+B-Test 1, 2, 3, 4 E-Oral question in practical class F-Simulated practical for line & power system comprising mathematical equations & functions G-Observe the student's performance in practical class L-Student practical performance result + report preparation **Evidence Attached** **Part (1)- Test questions** 2 tests **Part (2)-Evidence of students participation** (1) Signed attendance sheet (2) Signed Test attendance sheet (3) Sample answer paper & practical report Either hard or scanned copy (Will be available on request within 6 months of the assessment event (4) EBS attendance & grade record

1 On the job	**2** Simulated	**3** Blended	**4** Self-paced (facilitated)
5 Distance	**6** Electronic	**7** Face to Face	**8** Other (Please specify)

Key for Methods for Collecting Evidence:			
A Assignment	**B** Written task	**C** Role play	**D** Exam
E Oral questioning	**F** Simulation	**G** Observation	**H** Work based
I Portfolio	**J** Self assessment	**K** Case study	**L** Practical demonstration
M Project	**N** Training Record Book	**O** Other (Please specify)	

Location of Evidences (Table 1)

POWER SYSTEM Youtube video Lessons to provide the sufficient EKAS

G015/ IS67+68+ IS74

Page 196 to 231 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power System (1)

G015(AA)Lesson 1-Distribution system.zip

http://youtu.be/VuzjXkRx4UI

G015(AA)Lesson 2-Demand factor.zip

http://youtu.be/cUGbxhBT-Dc

http://youtu.be/DCCl4cO3Vu8

G015(AA)Lesson 3-Sag.zip

http://youtu.be/1s496h-Iuu8

G015(AA)Lesson 4-OH Line mechanical design.zip

http://youtu.be/T0BnyqV9T6E

http://youtu.be/hu1TrUv2_OY

G015(AA)Lesson 5-UG Cable.zip

http://youtu.be/hHCLzMnVmT0

http://youtu.be/A5AieaBBZHo

G015(AA)Lesson 6-Voltage control.zip

http://youtu.be/y1vTM5fvfyU

http://youtu.be/Z9HBGsVgymA

G015(AE)Lesson 1-Power system protection scheme.zip

http://youtu.be/ihpd3cDAhBU

http://youtu.be/EGXkLRM2L9M

http://youtu.be/zOIUYQ7OJfs

G015(AE)Lesson 2-Differential relay.zip

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson_3-Over_current_&_earth_fault_protection.zip

http://youtu.be/hvGjdO9jEhk

G015(AE)Lesson 4-Three phase differential relay.zip

http://youtu.be/2iW0oEScMsw

http://youtu.be/VuzjXkRx4UI

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson 5-Current time grading.zip

http://youtu.be/r0qkLrmkKsM

G015AE Lesson 6

http://youtu.be/InsTLh7_N5k

G015(AE)Lesson_7-CT_PT.zip

http://youtu.be/ZF_y65xsM_M

G015(AE)Lesson 8-Distance relay.zip

http://youtu.be/NKzMVquFLu8

http://www.filefactory.com/file/c386a2e/n/G015_AE_Lesson_8-Distance_relay.zip

G015(AE)Lesson 9-Telecom in power protection.zip

http://youtu.be/9C6ogqZAKRg

http://youtu.be/XRpffA6hU_U

http://youtu.be/X-kz3cyL9fU

G015(AG)Lesson 1-Stability.zip

http://youtu.be/fUyNqcXtBXg

G015(AG)Lesson 2-Generator load sharing.zip

http://youtu.be/A-t7XH4rK4M

http://youtu.be/OTsis_KIRuk

http://youtu.be/8j1nD9nY2hU

G015(AG)Lesson 3-Power Flow.zip

http://youtu.be/0OzT4Pol-Jc

http://youtu.be/fK0wcaTY_rw

G015(AG)Lesson 4-IP based system.zip

http://youtu.be/ve5O8K9fL7k

G015(AG)Lesson 5-Surge in power system.zip

http://youtu.be/6WkezTcOzX4

G015(AG)Lesson 6-CTPT Harmonic filter.zip

http://youtu.be/Uy7q9SsaOYs

G015(AG)Lesson 7-Short circuit in alternator.zip

http://youtu.be/b-46Kvn8kJI

G015(AG)Lesson 8-Corona.zip

http://youtu.be/XYGRAWOqzsc

G015(AG)Lesson 9-Power surge.zip

http://youtu.be/uzFS-otIn-g

http://youtu.be/IsZ_ccy630w

G015(AG)Lesson_10-Static_Var_Compensation.zip

http://youtu.be/y-of5oLojCU

G015(AG)Lesson 11-PF Control+Fuel cell.zip

http://youtu.be/AXbCcoQeLns

G015(AG)Lesson_12-Exercises.zip

http://youtu.be/nRGScOH9aSM

G037+G038+G039 Part 1/2/3+IS69
Page 232 to 270 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power System (2)

G037+G038+G039 Lesson 1-Power Flow.zip

http://youtu.be/mzwGGXRTtvw

G037+G038+G039 Lesson 2-Site Earthing.zip

http://youtu.be/PATkXVBF9kc

http://youtu.be/H4Dj1K238BE

G037+G038+G039 Lesson 3-Power System Control Equipments.zip

http://youtu.be/JJczbYVWOoI

G037+G038+G039 Lesson 4-Auxiliary System+Harmonic.zip

http://youtu.be/5mDNHGFLA0c

G037+G038+G039 Lesson 5-Harmonic.zip

http://youtu.be/n41q4Rmz2p0

http://youtu.be/8CelGV5AElk

G037+G038+G039 Lesson 6-Harmonic Calculation.zip

http://youtu.be/NHSzu6HkOgI

http://youtu.be/fSLrPIC6Mho

G037+G038+G039 Lesson 7-Synchronous Generator Loading.zip

:http://youtu.be/jv1q7Mtg7Gs

http://www.filefactory.com/file/c39be2f/n/G037_G038_G039_Lesson_7-Synchronous_Generator_Loading.zip

G037+G038+G039 Lesson 8-Turbine Control+Power Line Earthing.zip

http://youtu.be/0CvgkmDE3Kw

G037+G038+G039 Lesson 9-Insulator.zip

http://youtu.be/l4jqs8MLBFA

http://youtu.be/TiQezIA9Z-c

G037+G038+G039 Lesson 10-Reliability of Power System.zip

http://youtu.be/tIUk3nc1IxE

G037+G038+G039 Lesson 11-Harmonic Reduction.zip

http://youtu.be/8dYX-11kRcc

http://youtu.be/A684Agej8-w

G037+G038+G039 Lesson 12-Grounding + Power Quality.zip

http://youtu.be/QQPUj3WXJnA

G037+G038+G039 Lesson 13-Power Quality.zip

http://youtu.be/feI7SCb_QTY

http://youtu.be/mcK2YhDsnr0

G037+G038+G039 Lesson 14-Harmonic Model.zip

http://youtu.be/dwWBOq-BsLY

G037+G038+G039 Lesson 15-Harmonic Losses in Transformer.zip

http://youtu.be/mwEJgEEgPVc

http://youtu.be/1A6FY5f5ijM

http://youtu.be/yLiOKy7uJj0

G037+G038+G039 Lesson 16-Reliability Improvement.zip

http://youtu.be/cn-CfDWnUN8

G037+G038+G039 Lesson 17-Preparation for emergency.zip

http://youtu.be/La7Xip8GI2I

G037+G038+G039 Lesson 18-Harmonic problems.zip

http://youtu.be/0Urnkee_

http://youtu.be/zM_Xcwckicw

G037+G038+G039 Lesson 19-Synchronous machine problems.zip

http://youtu.be/Lx2S-NATr20

G037+G038+G039 Lesson 20-Power Generation + Generator Control.zip

http://youtu.be/56Ks8sArQxc

G037+G038+G039 Lesson 21-Turbine Control+ Digital Excitation.zip

http://youtu.be/uCsvv18qKwQ

http://youtu.be/I4vCDI2CZS0

G037+G038+G039 Lesson 22-Power System Protection.zip

http://youtu.be/c6iXRwfCYBU

G037+G038+G039 Lesson 23-Switch Gear.zip

http://youtu.be/DDpbzgNYTiM

http://youtu.be/2cl-nOdBNro

G040 + IS73

Page 271 to 284 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power transformer

G040 Lesson 1 Power transformer rating 1.zip

http://youtu.be/qjWJVQAh_jA

G040 Lesson 1 Power transformer rating 2.zip

http://youtu.be/JonzO8JD-k4

G040 Lesson 2 Open circuit short circuit test.zip

http://youtu.be/Ru-KlKv40OY

G040 Lesson 3 Transformer regulation.zip

http://youtu.be/t6IZMwMj-B4

G040 Lesson 4 Power transformer connection.zip

http://youtu.be/iig8PISDN1I

G040 Lesson 5 Maximum efficiency.zip

http://youtu.be/Qa7l0eHTWTU

G040 Lesson 6 Transformer parallel operation.zip

http://youtu.be/dkRxoaozrOk

http://youtu.be/Sz5QY727w-8

G040 Lesson 7 Harmonic in transformer.zip

http://youtu.be/_YOlWb3e574

G040 Lesson 8 Transformer problem + auto transformer.zip

http://youtu.be/0KCscbCIUjk

G040_Lesson_9_Transformer_rating_cooling_connection_tap_changing.zip

http://youtu.be/d3XHm-wguzQ

http://youtu.be/XwiIkZnKFqQ

http://youtu.be/uOHBk840Bhw

G040 Lesson 10 Phase shift transformer.zip

http://youtu.be/7aWhg9DIoWI

G042+IS71

Transmission Line

G042 Lesson 1-Transmission line introduction.zip

http://youtu.be/DrOOgcKeaL4

G042 Lesson 2-DC Line+Line reflection.zip

http://youtu.be/jvVdecp-clk

G042 Lesson 3-Power line calculation.zip

http://youtu.be/3TgVt67DhvY

http://youtu.be/QT6aqsaM7a0

http://youtu.be/WxjQIkdJjQ8

G042 Lesson 4-Line model+Economic aspect.zip

http://youtu.be/1HRdGZXp_-w

G042 Lesson 5-Time value of money+Line reflection.zip

http://youtu.be/n9mupLQWANY

http://youtu.be/YdfiX2gL-3c

G042 Lesson 6-Line matching+Wave guide.zip

http://youtu.be/1WyP5_Cek40

G042 Lesson 7-Wave guide.zip

http://youtu.be/BuGtjZ3QBXk

http://youtu.be/pftevsnbl0w

G042 Lesson 8-Microstrip line.zip

http://youtu.be/eINq1kKuiec

G042 Lesson 9-Per unit value of line.zip

http://youtu.be/66Y-Lm3EntI

G042 Lesson 10-Line constants.zip

http://youtu.be/2XYnZZ-zXII

G042 Lesson 11-Smith chart.zip

http://youtu.be/dv-NQh4vlrg

http://youtu.be/KfM8XZd9Wqc

http://youtu.be/3NYVQvW8-Nk

http://youtu.be/5qBwLsbtfTA

http://youtu.be/ViamcvqAy_I

http://youtu.be/j_nx9n7mGec

http://youtu.be/d53B3-zV2ec

G042 Lesson 12-Four terminals network.zip

http://youtu.be/HCO4P1qrPbA

G042 Lesson 13-Exercises.zip

http://youtu.be/LeyJf1PhpCY

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with IS71 Assessment Mapping.pdf

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	**UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems**		

Copy and paste the following table for each element as required

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1 Prepare to diagnose and rectify faults. Work performance	1.1	OHS procedures for a given work area are identified, obtained and understood	Advanced Diploma in Electrical Engineering Exercises Page 3 - Q15+16		
	1.2	OHS risk control measures and procedures in preparation for the work are followed	Advanced Diploma in Electrical Engineering Exercises Page 3 - Q17+18 Page 4 Q21+22		
	1.3	The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)	Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)		
	1.4	The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.	Advanced Diploma in Electrical Engineering Exercises Page 203) Q21 to 23		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.			Advanced Diploma in Electrical Engineering Exercises Page 150) Q 23 to 25
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety		**EP1,EP2,EP3 EP4**	Advanced Diploma in Electrical Engineering Exercises Page 153) Q 41 to 47
2.Diagnose and rectify faults.	2.1	OHS risk control measures and procedures for carrying out the work are followed.	As per 1.3		
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures			Advanced Diploma in Electrical Engineering Exercises Page 149) Q 13 to 20
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures	Advanced Diploma in Electrical Engineering Exercises Page 147) Q 1 to 10		
	2.4	Logical diagnostic methods are applied to diagnose electrical energy transmission system faults employing measurements and estimation of system operating parameters referenced to system operational requirements.		**Fault finding activities**	Advanced Diploma in Electrical Engineering Exercises Page 129) Q 64 to 70

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
	2.5	Suspected fault scenarios are tested as being the source of system problems.			As above
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system			As above
	2.7	Faults in the system components are rectified to raise electrical energy transmission system to its operation standard.			Advanced Diploma in Electrical Engineering Exercises Page 211) Q 50 to 54
	2.8	System is tested to verify that it operates as intended and to specified requirements.			As above
	2.9	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements			As above
	2.10	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes		Fault finding activities Page 13 of IS71 Assessment Mapping.pdf	
	2.10	Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to system and the surrounding environment or services and using sustainable energy practices.		As above	
3. Complete and report fault diagnosis and	3.1	OHS work completion risk control measures and procedures are followed.	As per 1.3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
rectification activities.					
	3.2	Work site is made safe in accordance with established safety procedures.	As per 1.3		
	3.3	Rectification of faults is documented in accordance with established procedures.		Fault finding activities Page 14 to 20 of IS71 Assessment Mapping.pdf	
	3.4	Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.		Fault finding activities Page 14 to 20 of IS71 Assessment Mapping.pdf	

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Receiving end voltage comparison between short/ medium and long transmission lines		EP1	
Long transmission line PI equivalent circuit Investigation		EP2	
Long transmission line T equivalent circuit Investigation		EP3	
Finding Transmission line efficiency/ Transformer effect on line efficiency		EP4	
Reactive power and power factor improvement		EP5	

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
<Insert knowledge evidence >	**Insert question number or task skill number** from assessment tool that address the specific, knowledge evidence.	**Insert question number or task skill number** from assessment tool that address the specific, knowledge evidence.	**Insert question number or task skill number** from assessment tool that address the specific, knowledge evidence.
T1 Overview of the transmission system	Advanced Diploma in Electrical Engineering Exercises Page 153) Q 41 to 47		
T2 The principles involved in high voltage a.c. transmission			Advanced Diploma in Electrical Engineering Exercises Page 149) Q 16 to 18
T3 The principles involved in d.c. transmission	Advanced Diploma in Electrical Engineering Exercises Page 147) Q 5 to 7		
T4 The principles of operation, voltage and current range, breaking capacity and field of use			Advanced Diploma in Electrical Engineering Exercises Page 147) Q 10 to 12
T5 The types of isolators in use			Advanced Diploma in Electrical Engineering Exercises Page 147) Q4
T6 Circuit breaker auxiliary systems			Advanced Diploma in Electrical Engineering Exercises Page 123) Q 1 to 4

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T7 The characteristics of lines and cables			Advanced Diploma in Electrical Engineering Exercises Page 117) Q 1 to 5 Q 24 to 30
T8 Control of voltage. Conditions leading to voltage collapse			Advanced Diploma in Electrical Engineering Exercises Page 117) Q 40 to 43
T9 Range of devices covered by SVCs	Advanced Diploma in Electrical Engineering Exercises Page 132) Q 19 to 21		
T10 Importance of the location in the system of voltage control devices			Advanced Diploma in Electrical Engineering Exercises Page 122) Q 23 to 44
T11 Use of graphical methods to calculate the size of VAr regulating plant			Advanced Diploma in Electrical Engineering Exercises Page 131) Q 19 to 21
T12 Types of communication systems including telephone, power line carrier,			Advanced Diploma in Electrical Engineering Exercises Page 132) Q 23 to 37
T13 Transient over-voltages in power systems	Advanced Diploma in Electrical Engineering Exercises Page 131) Q 14 to 18		
T14 Factors leading to the generation of corona.			Advanced Diploma in Electrical Engineering Exercises Page 130) Q 5 to 12

Add rows to the following table as required

Assessment Conditions	Assessment	Assessment	Assessment

	event 1 Written Test	event 2 Practical & Observation	event 3 Assignment
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments Records relating to electrical engineering resources	Test 1 + 2	Practical EP1 to 5	All assignments

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

(1) Delivery & collection of evidence

1 Prepare to diagnose and rectify faults. Work performance

1.1 OHS procedures for a given work area are identified, obtained and understood

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q15+16

www.electricaldiploma2013.webs.com Then access Click **HERE** to download the Exercises

http://www.mongroupsydney1.com/Advanced_Diploma_in_Electrical_Engineering_Exercises_EE011.pdf

Relevant Instruction Lessons

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

Q1.Describe the risks and dangers in power station and outline the recommended safety
Q2.equipments and emergency procedures.
Q3.Outline the process of maintenance work in substation.

1.2 OHS risk control measures and procedures in preparation for the work are followed

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q17+18 Page 4 Q21+22
Q4. Write down the check list to perform the tasks in substation.
Q5. Write down the safety procedures and methods to assess the risk and to reduce the risk.
Q6..Write down the code of practice for working near exposed main and apparatus.
Q7.Which precautions are to be emphasized when working in substation?

1.3 The likely extent of work to be undertaken is envisaged from reports and/or discussions with appropriate person(s)

Q8. Write down the risk reduction procedures in maintenance work to discuss with work manager. (Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)

1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.

Answer the following questions to seek the advice from work supervisor in the following aspects.
Q9. What are the risks?
Q10.How are the risks classified?
Q12.How can the risk be evaluated?
Q12.How will you manage the risk? Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q8 to 11)

1.4 The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 203)

(11) Positive, negative and zero sequence

Slide 1+2+3+4

Q21.Z1= 20% Z2= 15% 200MVA base A to B fault at 33KV Find fault currents.

Slide 5

Q22.Z1 = 5% Z2 = 10% Zo = 20%, 200MVA 132 KV line to ground fault. Find fault current.

Slide 6+7+8

Q23. Z1 = 70% Z2= 70% Zo = 30 % Base MVA = 200 MVA E = 66KV 2 Line to ground fault.
Calculate fault current.

1.5 Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.

1.6 Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety

Ref-Advanced Diploma in Electrical Engineering Exercises Page 150)

Slide 15+16+17

Q23.A three phase 66KV line is supplying 500 KW at 0.85 PF lagging. Line resistance, inductive reactance and capacitive reactance are 1Ω, 4Ω and 3000Ω respectively. Calculate the sending end voltage by using equivalent Pi circuit.

Slide 18+19

Q24. What factors are to be considered for power system planning.

Slide 20+21

Q25.A sum of $2000 is invested at 5% for 15 years at compound interest.

(a) Calculate the sum at the end of 15 years

(b) If instead of lump sum at the end of 15 years, the loan of $2000 is to be paid by the fixed around each year, calculate the annual amount.

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Slide 1+2+3
Q41.What is transmission line . Explain the components of it.
Slide 4_6
Q42.Explain maximum transfer of electrical energy.
Slide 5+7+8
Q43.Explain surge impedance loading.
Slide 9
Q44.Describe long and short transmission lines.
Slide 10+11+12+13
Q45.Explain (a)Propagation constant (b) Line model & SIL
Slide 14+15
Q46.Write the equations to calculate complex power.
Slide 16
Q47.What are the difference between balanced line & unbalance line.

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS71 Assessment 2 /Question Marking scheme Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS71 Assessment 2/ Assessment Cover Sheet Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS71 Assessment 2/ Assessment Feedback Sheet
Students' work in own	Summative Assessment- Formal	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS71 Assessment 2 /

record	Tests	Student Work
	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS71 Assessment 2 / Student Work Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 2016 Attendance Records+Record Book

2 Diagnose and rectify faults.

2.1 OHS risk control measures and procedures for carrying out the work are followed.

As per 1.3

2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.

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4) Power factor connection

Slide 1+2+3+4+5+6+7

Q13.What is power factor. What are the effects of poor power factor

Q14.Four three phase 415V 50HZ loads are connected together in an industrial installation. Determine (a) Total load (b) Total power factor (c) The value of capacitor required PF to 0.98

Slide 8+9

Q15.A load with a PF 0.7 lagging dissipates 1500W from 240V , 50HZ supply. It is required to correct the PF to 0.95 lagging. Find (a) The original and final currents (b) The value of the component to be added in parallel with the original load to achieve the required PF correction.

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(5) Overhead transmission line

Slide 1+2

Q16.Sketch Tee and Pi equivalent circuits of transmission line and vector diagram.

Slide 3+4

Q17.Sketch two ports network equivalent circuit and write the equation.

Slide 5

Q18.By doing open circuit test and short circuit test for parallel line model, the following values are obtained.

OCT—Vs= 12V , Vr=12.5V Is = 0.1 amp
SCT---Vs = 13V, Ir = 0.4A Is = 0.48 amp
Find the generalized equation
Slide 6
Q19.Sketch power transformer protection circuit.
Slide 7
Q20.Sketch recloser

2.3Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 147)

Slide 1+2+3
Q1.Compare the copper weight of 3 phase 3 wires system & simple dc system
Slide 4+5
Q2.Explain voltage variations in power system
Slide 6
Q3.Sketch induction motor & synchronous motor
Slide 7
Q4.Explain the components of circuit breaker

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(3) Reflection in transmission line
Slide 1+2+3+4+5
Q8.A 60Ω transmission line connected to load impedance 100+j70 Ω. The forward RMS valresiue on line is 30V. Line impedance is 30Ω
Calculate (a) Power delivered to resistance part of load impedance
(b) RMS current in impedance, reflected wave voltage
(c) Peak voltage forward & backward wave
(d) Voltage standing wave ratio (VSWR)
(e) Return loss in decibel
Slide 6
Q9.Explain the impact of switching in power line

Slide 7+8+9+10
Q10.A coil of 20H inductance and 10Ω resistance is connected in parallel with a 30Ω resistor across a 150V dc supply which is suddenly disconnected.
Find
(a) Initial rate change of current after switching
(b) The voltage across 30Ω resistor initially after 0.4 sec
(c) The voltage across the switch contacts at the instance of separation
(d) The rate at which the coil is losing stored energy 0.3 sec after switching

2.4 Logical diagnostic methods are applied to diagnose electrical energy transmission system faults employing measurements and estimation of system operating parameters referenced to system operational requirements.

2.5 Suspected fault scenarios are tested as being the source of system problems.

2.6 Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of the control system.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 129)

To determine the quality of the operational status of protection system, it needs to ensure relay operation sequence, the sequential relay protection system and characteristics are to be investigated. The following activities and questions provide this competency.
(32)Over current & earth fault protection , Directional protection, operating characteristics
Slide 1
Q64.Sketch the diagram of over current protection
Slide 2
Q65.Sketch earth fault relay protection diagram.
Slide 3
Q66.Sketch the combined over current and earth fault protection and explain it's operation.
Slide 4
Q67.Explain the operation of directional relay with diagram.
Slide 5+6+7+8
Q68.Locate directional & non directional elements in ring system.
Slide 9+10
Q69.Sketch the connection diagram of combinational protection scheme that contains two over current relays and one earth fault relay to provide phase to phase and phase to earth protection.

Slide 11
Q70.How will you adjust definite minimum time point on relay curve?

2.7 Faults in the system components are rectified to raise electrical energy transmission system to its operation standard.
2.8 System is tested to verify that it operates as intended and to specified requirements.

2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.

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(11) Change control
Slide 1
Q50.Describe the overview of change control system.
Slide 2
Q51.Explain the establishment of contracts
Slide 3
Q52.Outline the project control system responding the disturbances.
Slide 4
Q53.Sketch the procedure for preparing quality manual.
Slide 5+6
Q54.Explain management leadership.

Refer Power System Practicals

Part 1: Operational Study

Lab No	Name of Practical	Equipments	Assessment
	Group 1 Power & Line		
EP1	Receiving end voltage comparison between short/ medium and long transmission lines	distribution system types	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP2	Long transmission line PI equivalent circuit	overhead systems	As above
EP3	Long transmission line T equivalent circuit	distribution system types	As above
EP4	Transmission line efficiency/ Transformer effect on line efficiency	energy metering • demand meters	As above
EP5	Reactive power and power factor improvement	energy metering • demand meters	As above
EP6	PF effect on line current	energy metering • demand meters	As above
EP7	Corona Video	• surge protection	Report presentation, conclusion
EP8	Phase sequence measurement		Competency assessment
	GROUP 2- Protection equipments		
EP9	Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply)	protection equipment and systems	Competency assessment

EP10	Current transformer & potential transformer connection & ratio test	current transformers • potential transformers	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP11	Over current relay characteristics	protection equipment and systems • over-current protection	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP12	Electronic relay test	conventional relays • electronic relays	As above
EP13	Study of various protective relays used in industry through trade references	• earth fault protection • differential protection busbar protection • surge protection • conventional relays	Research, report presentation
	Group 3- Supply System		
EP19	Underground cable capacitance test	underground systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP20	High tension line design	• overhead systems	Design project
EP21	Line insulator test & capacitance grading	• overhead systems	Circuit interpretation, connection, data collection, calculation, graph sketch, report presentation, conclusion
EP22	Voltage profile chart of distribution system	• voltage regulation equipment • on load tap changers	As above
EP23	Load centre-Power loss comparison	• distributor equipment	As above

EP30	Transformer polarity test	• distributor equipment	As above
EP42	Maximum power transfer theorem with power circuit	• load control	As above
EP43	Load flow study	• load control	As above
EP45	Trade reference study, switch board, busbar, insulator, circuit breakers	reclosers / sectionalisers.	As above

2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.

2.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to system and the surrounding environment or services and using sustainable energy practices.

General faults including: open-circuit; short-circuit; incorrect connections; insulation failure; unsafe condition; apparatus/component failure; related mechanical failure for the equipments in the range

(2)**Explore some of the faults in power system/ energy supply that can be rectified only by utilizing para-professional knowledge background and how the arranged simulated practical can provide the hand on experience and work performance for the students and how it is different from the performance only based on trade level activities.**

In range of performance, it outlines the real equipments used in the industry. There will be the arguments that the setting of practical in lab room only includes rheostat, resistor, varic, capacitor etc. How it meets the outlined competencies?
To exactly find out and rectify the faults in energy supply system , the tasks and complexity level more than the trade level- (check the continuity, check the connection, visual inspection, testing and measurement)will be included.
The following is the various power system faults which I draw out from my power engineer work records that the technical knowledge higher than trade level is required to successfully rectify the fault and determine the appropriate solutions. In the table, I summarize how the fault is , caused, background theory, how the person who knows the theory will do, how the person who does not know the theory will do and how my simulated practical / and practical related background theory will assist to develop the fault finding skill.

Typical fault	Cause	Related Theory	How the person who does not know the theory will do	How the person who knows theory will do	Name of simulated practical	How to develop the skill
(1)In reticulation system, there is abnormally different in voltages	Abnormal resistance. Wrong cable selection. Abnormal circuit configuration	Voltage profile chart.	May give he other idea to change the load	Measure voltage, sketch the voltage profile chart. Then identify the portion of the circuit.	EP 23 Voltage profile chart	Develop the analytical skills to identify the fault point
(2)Line conductor slips from the pin insulator	Line deviation is too high, combination of wind, conductor tension will take away the conductor from pin insulator	Line deviation angle calculation	Will reinstall the line. After some period, he same thing will happen again	Will examine line deviation angle. Tension, wind force. Will rearrange the line or provide shackle insulator	Theory instruction. Line deviation	Develop the problem solving skill on line construction.
(3)Conductor sag too low. Hit by traffic and then broken	Sag calculation. Wrong tension, safety factor, weight	Sag/ line design	Pull up the cable. After some time, it will fall again	Will examine the related parameters and find the way	EP 20 High Tension Line Design	Develop the skill on line design and to know the technical factors for sag.
(4)Discharge current flows out from underground insulator and cause the injury	UG cable capacitance. Charging current	UG Cable capacitance test	Will think about current flow, leakage etc.	Will examine the UG cable capacitance and produce the procedure for discharging	EP 19 Underground cable capacitance test	Develop the skill in UG cable testing focus on capacitance and estimate the amount of charging current
(5)Line pole broken without natural disaster	In appropriate pole strength	Pole mechanical design	Will erect the pole. Some time after, broken gain	Will examine he tension, wind force, conductor weight, then will calculate the pole strength and select appropriate diameter of pole and appropriate pole material	Pole mechanical design lesson + EP 20 High tension line design	Develop the skill on line design and to know the technical factors for pole.

Location of Evidences (Table 1)

3 Complete and report fault diagnosis and rectification activities.

3.1 OHS work completion risk control measures and procedures are followed.

3.2 Work site is made safe in accordance with established safety procedures.

As per 1.3

3.3 Rectification of faults is documented in accordance with established procedures.

3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

Fault	**Reason**	**Related theory**	**The person who does not know the theory will do**	**The person who knows the theory will do**	**Related Practical**	**Development of skill**
(6)There are too much power loss. Line efficiency is poor	If all connected loads are all right, wrong location of power station/ load centre	Load centre study	Will not take account on load centre	Will take account on load centre	EP23 Load centre power loss comparison	How the location of supply source affect line losses/ efficiency and % voltage regulation
(7)Problem with UG cable joint	Wrong method in UG cable joining	UG cable joining methods. Theory study			UG cable joining method in my prepared 7762 AA Electrical Distribution textbook	UG cable joining methods. Theory PLUS photographs
(8)Generator got motor action. Reverse power relay cuts off	Out of synchronism. Up to 180 degree out of phase	Synchronizing	Will neglect synchronism. Just run and switch on	Will focus on synchronizing process. Avoid reverse power relay operation	Synchronizing	Synchronism, generator parallel operation requirement practical knowledge development.
(9)Generator vibration/ hunting	Stability concept	System stability	Do not care on machine hunting. Will continue to run . As consequence, face the short life of bearing/ shaft	Will take care on transient and steady state system stability and prevent the hunting	Moment of inertia/ machine stability	Moment of inertia/ machine stability practical knowledge development.
(10)Relay operates on fault. But the system loss the synchronism	System stability/ critical fault clearing angle aspect.	System stability/ critical fault clearing angle	Do not care on the relay setting to provide both fault protection and maintain the system stability. Re-synchronize the generators when ever the relay operates	Will set the proper relay setting to maintain the stability	Critical fault clearing angle. Equal area criteria	Critical fault clearing angle. Equal area criteria practical knowledge development.
(11) Line reactive	Problem related to	Load flow study	Will not take account	Take account on load	EP 42 Maximum	Develop the load flow

power too much. The equipment capacity is unnecessarily increased	load flow		on load flow concept.	flow and optimize the loading	power transfer theorem EP43 Load flow study	concept and practical optimizing skill
(12)There is nothing wrong with the line but the transformer placed near the switch heat up and cooked	Switching surge	Switching voltage surge	Just replace the transformer. After some time, the same problem will be faced	Take account on switching voltage surge and plan tom install the surge diverter.	Switching voltage surge	Switching voltage surge practical knowledge development.
(13)Light radiated from the power line. Too much power loss and high interference to telecom line	Corona	Corona study	Will consider the ACT OF GOD	Will find the way to reduce corona such as application of hollow conductor to increase diameter of conductor to raise the critical voltage level	EP 7 Corona video	How corona occurs and find the way to prevent .
(14) Control telecommunication for power line down, no relay operates	Application of telecommunication system in power system operation	Application of telecommunication system in power system operation 7762AG Power System Operation	Will not be aware of the role of telecommunication system	Will check the function of telecom equipment for power system control and protection and perform the preventive maintenance	Application of telecommunication system in power system operation	Web based control/ IP based control and telecomm: concepts practical knowledge development.
(15)Too much flickering of lamps	Harmonics	Harmonics in power system	Will not know what happens	Will check the harmonics source/ increase the size of neutral wire to allow the harmonics current flows	Harmonic source scope observation	Development of identifying the harmonics
(16)Lightning strike	Lightning arrester	Lightning arrester	Will reinstall LA. But not sure it will be safe or not.	Will check the coverage provided by lightning arrester	Lightning arrester study	Lightning arrester practical knowledge development.
(17)Earth fault/ earth leakage can not be protected	Grounding in power system	Grounding in power system 7762AE Power System Protection	--	Will measure the ground resistance, will implement the additional ground connections	Power system grounding study	Power system grounding practical knowledge development.
(18)Occurance of over current	Over current protection	Over current relay 7762AE Power System Protection	Will not exactly know how to set/ adjust the over current relay	Will set/ adjust the over current relay	EP11 Over current relay characteristics	Practical skill development in over current relay
(19)Earth leakage fault	Earth leakage protection	Earth leakage protection 7762AE Power System Protection	Will not exactly know how to set/ adjust the earth leakage relay	Will set/ adjust the earth leakage relay/ CT arrangement	CT arrangement for earth leakage fault & fault in protected zone	Practical skill development in earth leakage fault protection

(20)Transformer protection	Differential relay	Differential relay	Will not exactly know how to set/ adjust the differential relay	Will set/ adjust the differential relay	CT arrangement for fault in protected zone	Practical skill development in differential protection
(21)Line is protected by differential/ over current relay. But it is not effective when the load are fed from some part of the line	Distance relay	Distance relay	Will not exactly determine the reason why and how to change the protection system	Will change the protection system and will calculate earth fault impedance	Earth fault calculation	Problem solving skill development in earth fault calculation
(22)Fault happens but the relay can not provide the effective protection	CT/ PT ratio for relay	Relay protection scheme	Will not exactly determine the reason why and how to change the protection system	Will adjust CT PT ratio at the simulated fault situation and will adjust the relay setting appropriately	EP9 Connection of relay protection scheme & protective equipments by using one line diagram (Circuit interpreting & connection competency development without electrical supply) EP10 Current transformer & potential transformer connection & ratio test	Practical skill development in CT PT ratio adjustment
(23) I accidently open the CT secondary and it got explosion	Current transformer	Current transformer		Will make sure not to open circuit the CT secondary	EP10 Current transformer & potential transformer connection & ratio test	Develop the skill on CT/ PT connection & applications.
(24) we use old type gravity relay, it does not provide the effective protection	Restrainting system of relay	Relay types & characteristics		Will make sure to correctly arrange the relay position	EP13 Study of various protective relays used in industry through trade references	Knowledge development on various protective relays used in industry through

						trade references
(25) Relay operates at wrong current	Operation/ setting of relay	Relay types & characteristics	Trial error approach will be used	Will make sure to correctly arrange the relay setting	EP11 Over current relay characteristics	Practical skill development in over current relay
(26)In power transformer protection. Transformer is Star/Delta connection. All relay settings are correct. But relay wrongly operates. I checked all continuity. Every thing all right	Transformer Star Delta & relay star/delta matching	Star delta vector diagram. Transformer star side –Relay delta & transformer delta—Relay star	Will not know what happens and how to rectify the fault	Will check the connection and will consider the vector difference causes the wrong operation	EP10-CT & PT connection/ ratio check	Practical skill development in CT/PT Connection
(27)Regulator is set to meet the system voltage condition. But later time, it is blown out	Voltage ratio/ regulator setting	Voltage regulator	Will emphasize in solving the problem for a short moment. Will not consider the long term impact	Will consider whether the setting to upgrade the voltage will impact on future system voltage change	EP22 Voltage profile chart of distribution system	The skill training to develop the judgment of voltage level and future impact
(28)Fault spread from one busbar to another busbar	Busbar arrangement/ sectionalization	Busbar arrangement	Will assemble he busbar to install the equipment, will not consider how the arrangement can contribute the spread of fault	Will consider the way to insert section circuit breakers	Busbar layout/ arrangement study	Busbar arrangement sketch/ plan practice development
(29)Equipment suffers over voltage and blown out after the capacitor value is changed for PF improvement	Inappropriate capacitor setting. Cause of overvoltage. Vector diagram	PF improvement/ Capacitive reactance effect on load	Will only see the way to improvement the PF. Will not know the consequences	Will posses the knowledge of capacitor impact on load voltage and will take account on optimal setting of capacitor value	EP5-capactance effect on line EP6-PF Improvement	PF improvement method is judgment with capacitor effect causes over voltage. This skill is trained.
(30)Directional relay does not work to protect the reverse power flow	Directional relay operation	Study on directional relay.		Wrong connection to direction coil will be identified	EP 13 Protective relays used in industry	Guide to acquire the relevant technical knowledge
(31)Voltage flashing over capacitor string	Capacitor string	Study on capacitor string	Will change the capacitor string	Will provide the preventive protection such as arcing horns OR take account on line capacitor grading	EP21 Line insulator capacitance test	Develop the skill to measure line capacitor value . Capacitance grading.

(32)Circuit Breaker itself is blown out	Circuit Breaker capacity	Study on capacity of circuit breaker	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault	EP13 Relay & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(33)CB too hot and meltdown	CB capacity/ Arc development	Study on capacity of circuit breaker/electric arc	Will change CB. After sometime, it will blow up again.	Will consider the CB capacity & possible over current developed in line fault Will consider the arc extinguishing methods	EP13 Rely & CB used in system Fault current	Develop the skill in fault current estimate and choosing CB capacity
(34)Need to expand the line in emergency. I am only in-charge	Line design	Line design project	Will not know how to design a line	Will utilize references/ methods to design and construct the line	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(35)HV current flows into LV line	Separation between HV & LV line	Rules & regulations related to line	Will not know the regulation	Will apply the regulation in real wok	7762AA Line pole/ cross arm design and conductor arrangement	Line electrical & mechanical design practice development
(36) Line wire fracture	Sag calculation	Sag calculation/ minimum cable size	Reinstall the line wire. Like part to like part replacement is applied, will use the same size of cable. After sometime, line will break gain	Will consider allowable tension/ minimum conductor size	7762AA Project-Over head line design	Line electrical & mechanical design practice development
(37)Electronics equipment used for line protection is blown up	Voltage surge	Signal condition sub system. Surge filter	Will replace the electronic board. But the same fault happens again	Will consider the cause of surge. Surge filter / absorber/ diverter will be installed	7762AE Line surge/ application of electronic control system	Develop the skill in line surge/ electronic control.
(38) Receiving end voltage is greater than the sending end	Capacitance effect on long line	Long line 7762AG Power System Operation	Will think that the equipments are designed to operate at the sending end voltage level, it will be enough	Will consider the line configuration and will provide the appropriate arrangement for over voltage caused by capacitance effect on long line.	EP2/EP3 Long Line PI & TEE equivalent circuits	Develop the practical skill in determination of possible voltage rise in simulated line model.
(39)Can not run the generators in parallel	Synchronism problem	Synchronizing	Will not properly know the synchronism	Will consider the synchronism	Alternator parallel operation- Procedure	Develop he knowledge in synchronizing
(40) Over current relay is provided to protect the system but it does not work when	Characteristics of relays	Relay types and characteristics	Will think that one relay will protect everything	Will select the appropriate relay for appropriate place and protection task	EP13 Study of various protective relays used in	Knowledge development on various protective relays used in

the ground fault occurs					industry through trade references	industry through trade references

Method of delivery	**Method of collection of evidence**
7-Face to face 6-Electronic Key for delivery mode 1-On the job 2-Simulated 3-Blended 4-Self paced 5-Distance 6-Electronic 7-Face to face 8-Other Detailed explanation Face to face class teaching + Online supplement multimedia notes	A,B,D,E,F,G,L Key for Methods for Collecting Evidence: A-Assignment B-Written Task C-Role play D-Exam E-Oral questioning F-Simulation G-Observation H-Work based I-Portfolio J-Self assessment K-Case study L-Practical demonstration M-Project N-Training Record O-Other Detailed explanation A+B-Test 1, 2, 3, 4 E-Oral question in practical class F-Simulated practical for line & power system comprising mathematical equations & functions G-Observe the student's performance in practical class L-Student practical performance result + report preparation

Evidence **Part 1- Evidence of teaching & learning** **Plan for concurrently delivery** www.powerlearning1.zoomshare.com Both digitised notes + multimedia notes including audio files Notes in USB (Available on request) **Part 2- Evidence of lesson planning** (1) Delivery & assessment matrix excel form (2) Semester plan (3) Students study progress plan (Available on request)	**Evidence Attached** Part (1)- Test questions 2 tests Part (2)-Evidence of students participation (1) Signed attendance sheet (2) Signed Test attendance sheet (3) Sample answer paper & practical report Either hard or scanned copy (Will be available on request within 6 months of the assessment event (4) EBS attendance & grade record

1 On the job	**2** Simulated	**3** Blended	**4** Self-paced (facilitated)
5 Distance	**6** Electronic	**7** Face to Face	**8** Other (Please specify)

Key for Methods for Collecting Evidence:							
A	Assignment	**B**	Written task	**C**	Role play	**D**	Exam
E	Oral questioning	**F**	Simulation	**G**	Observation	**H**	Work based
I	Portfolio	**J**	Self assessment	**K**	Case study	**L**	Practical demonstration
M	Project	**N**	Training Record Book	**O**	Other (Please specify)		

Location of Evidences (Table 1)

ASSESSMENT SCHEDULE

Performance Criteria	Assessment 1 Practical		Assessment 2 Theory
	Continuous Observation	Written Assessment as part of Practical	Written Assessment
1.1		X	
1.2		X	
1.3		X	X
1.4		X	X
1.5		X	X
1.6		X	X
2.1		X	
2.2		X	X
2.3		X	X
2.4		X	X
2.5		X	X
2.6		X	X
2.7		X	X
2.8		X	X
2.9		X	X
2.10		X	X
2.11		X	X
2.12		X	X
3.1	X	X	
3.2	X		
3.3	X		

3.4	X		
EKAS Assessment		X	X

POWER SYSTEM Youtube video Lessons to provide the sufficient EKAS

G015/ IS67+68+ IS74

Page 196 to 231 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power System (1)

G015(AA)Lesson 1-Distribution system.zip

http://youtu.be/VuzjXkRx4UI

G015(AA)Lesson 2-Demand factor.zip

http://youtu.be/cUGbxhBT-Dc

http://youtu.be/DCCl4cO3Vu8

G015(AA)Lesson 3-Sag.zip

http://youtu.be/1s496h-Iuu8

G015(AA)Lesson 4-OH Line mechanical design.zip

http://youtu.be/T0BnyqV9T6E

http://youtu.be/hu1TrUv2_OY

G015(AA)Lesson 5-UG Cable.zip

http://youtu.be/hHCLzMnVmT0

http://youtu.be/A5AieaBBZHo

G015(AA)Lesson 6-Voltage control.zip

http://youtu.be/y1vTM5fvfyU

http://youtu.be/Z9HBGsVgymA

G015(AE)Lesson 1-Power system protection scheme.zip

http://youtu.be/ihpd3cDAhBU

http://youtu.be/EGXkLRM2L9M

http://youtu.be/zOIUYQ7OJfs

G015(AE)Lesson 2-Differential relay.zip

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson_3-Over_current_&_earth_fault_protection.zip

http://youtu.be/hvGjdO9jEhk

G015(AE)Lesson 4-Three phase differential relay.zip

http://youtu.be/2iW0oEScMsw

http://youtu.be/VuzjXkRx4UI

http://youtu.be/2iW0oEScMsw

G015(AE)Lesson 5-Current time grading.zip

http://youtu.be/r0qkLrmkKsM

G015AE Lesson 6

http://youtu.be/InsTLh7_N5k

G015(AE)Lesson_7-CT_PT.zip

http://youtu.be/ZF_y65xsM_M

G015(AE)Lesson 8-Distance relay.zip

http://youtu.be/NKzMVquFLu8

http://www.filefactory.com/file/c386a2e/n/G015_AE_Lesson_8-Distance_relay.zip

G015(AE)Lesson 9-Telecom in power protection.zip

http://youtu.be/9C6ogqZAKRg

http://youtu.be/XRpffA6hU_U

http://youtu.be/X-kz3cyL9fU

G015(AG)Lesson 1-Stability.zip

http://youtu.be/fUyNqcXtBXg

G015(AG)Lesson 2-Generator load sharing.zip

http://youtu.be/A-t7XH4rK4M

http://youtu.be/OTsis_KIRuk

http://youtu.be/8j1nD9nY2hU

G015(AG)Lesson 3-Power Flow.zip

http://youtu.be/0OzT4Pol-Jc

http://youtu.be/fK0wcaTY_rw

G015(AG)Lesson 4-IP based system.zip

http://youtu.be/ve5O8K9fL7k

G015(AG)Lesson 5-Surge in power system.zip

http://youtu.be/6WkezTcOzX4

G015(AG)Lesson 6-CTPT Harmonic filter.zip

http://youtu.be/Uy7q9SsaOYs

G015(AG)Lesson 7-Short circuit in alternator.zip

http://youtu.be/b-46Kvn8kJI

G015(AG)Lesson 8-Corona.zip

http://youtu.be/XYGRAWOqzsc

G015(AG)Lesson 9-Power surge.zip

http://youtu.be/uzFS-otIn-g

http://youtu.be/IsZ_ccy630w

G015(AG)Lesson_10-Static_Var_Compensation.zip

http://youtu.be/y-of5oLojCU

G015(AG)Lesson 11-PF Control+Fuel cell.zip

http://youtu.be/AXbCcoQeLns

G015(AG)Lesson_12-Exercises.zip

http://youtu.be/nRGScOH9aSM

Power System (2)

G037+G038+G039 Lesson 1-Power Flow.zip

http://youtu.be/mzwGGXRTtvw

G037+G038+G039 Lesson 2-Site Earthing.zip

http://youtu.be/PATkXVBF9kc

http://youtu.be/H4Dj1K238BE

G037+G038+G039 Lesson 3-Power System Control Equipments.zip

http://youtu.be/JJczbYVWOoI

G037+G038+G039 Lesson 4-Auxiliary System+Harmonic.zip

http://youtu.be/5mDNHGFLA0c

G037+G038+G039 Lesson 5-Harmonic.zip

http://youtu.be/n41q4Rmz2p0

http://youtu.be/8CelGV5AElk

G037+G038+G039 Lesson 6-Harmonic Calculation.zip

http://youtu.be/NHSzu6HkOgI

http://youtu.be/fSLrPIC6Mho

G037+G038+G039 Lesson 7-Synchronous Generator Loading.zip

:http://youtu.be/jv1q7Mtg7Gs

http://www.filefactory.com/file/c39be2f/n/G037_G038_G039_Lesson_7-Synchronous_Generator_Loading.zip

G037+G038+G039 Lesson 8-Turbine Control+Power Line Earthing.zip

http://youtu.be/0CvgkmDE3Kw

G037+G038+G039 Lesson 9-Insulator.zip

http://youtu.be/l4jqs8MLBFA

http://youtu.be/TiQezIA9Z-c

G037+G038+G039 Lesson 10-Reliability of Power System.zip

http://youtu.be/tIUk3nc1IxE

G037+G038+G039 Lesson 11-Harmonic Reduction.zip

http://youtu.be/8dYX-11kRcc

http://youtu.be/A684Agej8-w

G037+G038+G039 Lesson 12-Grounding + Power Quality.zip

http://youtu.be/QQPUj3WXJnA

G037+G038+G039 Lesson 13-Power Quality.zip

http://youtu.be/feI7SCb_QTY

http://youtu.be/mcK2YhDsnr0

G037+G038+G039 Lesson 14-Harmonic Model.zip

http://youtu.be/dwWBOq-BsLY

G037+G038+G039 Lesson 15-Harmonic Losses in Transformer.zip

http://youtu.be/mwEJgEEgPVc

http://youtu.be/1A6FY5f5ijM

http://youtu.be/yLiOKy7uJj0

G037+G038+G039 Lesson 16-Reliability Improvement.zip

http://youtu.be/cn-CfDWnUN8

G037+G038+G039 Lesson 17-Preparation for emergency.zip

http://youtu.be/La7Xip8GI2I

G037+G038+G039 Lesson 18-Harmonic problems.zip

http://youtu.be/0Urnkee_

http://youtu.be/zM_Xcwckicw

G037+G038+G039 Lesson 19-Synchronous machine problems.zip

http://youtu.be/Lx2S-NATr20

G037+G038+G039 Lesson 20-Power Generation + Generator Control.zip

http://youtu.be/56Ks8sArQxc

G037+G038+G039 Lesson 21-Turbine Control+ Digital Excitation.zip

http://youtu.be/uCsvv18qKwQ

http://youtu.be/I4vCDI2CZS0

G037+G038+G039 Lesson 22-Power System Protection.zip

http://youtu.be/c6iXRwfCYBU

G037+G038+G039 Lesson 23-Switch Gear.zip

http://youtu.be/DDpbzgNYTiM

http://youtu.be/2cl-nOdBNro

G040 + IS73

Page 271 to 284 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Power transformer

G040 Lesson 1 Power transformer rating 1.zip

http://youtu.be/qjWJVQAh_jA

G040 Lesson 1 Power transformer rating 2.zip

http://youtu.be/JonzO8JD-k4

G040 Lesson 2 Open circuit short circuit test.zip

http://youtu.be/Ru-KlKv40OY

G040 Lesson 3 Transformer regulation.zip

http://youtu.be/t6IZMwMj-B4

G040 Lesson 4 Power transformer connection.zip

http://youtu.be/iig8PISDN1I

G040 Lesson 5 Maximum efficiency.zip

http://youtu.be/Qa7l0eHTWTU

G040 Lesson 6 Transformer parallel operation.zip

http://youtu.be/dkRxoaozrOk

http://youtu.be/Sz5QY727w-8

G040 Lesson 7 Harmonic in transformer.zip

http://youtu.be/_YOlWb3e574

G040 Lesson 8 Transformer problem + auto transformer.zip

http://youtu.be/0KCscbCIUjk

G040_Lesson_9_Transformer_rating_cooling_connection_tap_changing.zip

http://youtu.be/d3XHm-wguzQ

http://youtu.be/XwiIkZnKFqQ

http://youtu.be/uOHBk840Bhw

G040 Lesson 10 Phase shift transformer.zip

http://youtu.be/7aWhg9DIoWI

G042+IS71

Page 285 to 307 of http://www.filefactory.com/file/cf9bf8f/n/Video_Lessons.pdf

Transmission Line

G042 Lesson 1-Transmission line introduction.zip

http://youtu.be/DrOOgcKeaL4

G042 Lesson 2-DC Line+Line reflection.zip

http://youtu.be/jvVdecp-clk

G042 Lesson 3-Power line calculation.zip

http://youtu.be/3TgVt67DhvY

http://youtu.be/QT6aqsaM7a0

http://youtu.be/WxjQIkdJjQ8

G042 Lesson 4-Line model+Economic aspect.zip

http://youtu.be/1HRdGZXp_-w

G042 Lesson 5-Time value of money+Line reflection.zip

http://youtu.be/n9mupLQWANY

http://youtu.be/YdfiX2gL-3c

G042 Lesson 6-Line matching+Wave guide.zip

http://youtu.be/1WyP5_Cek40

G042 Lesson 7-Wave guide.zip

http://youtu.be/BuGtjZ3QBXk

http://youtu.be/pftevsnbl0w

G042 Lesson 8-Microstrip line.zip

http://youtu.be/eINq1kKuiec

G042 Lesson 9-Per unit value of line.zip

http://youtu.be/66Y-Lm3EntI

G042 Lesson 10-Line constants.zip

http://youtu.be/2XYnZZ-zXII

G042 Lesson 11-Smith chart.zip

http://youtu.be/dv-NQh4vlrg

http://youtu.be/KfM8XZd9Wqc

http://youtu.be/3NYVQvW8-Nk

http://youtu.be/5qBwLsbtfTA

http://youtu.be/ViamcvqAy_I

http://youtu.be/j_nx9n7mGec

http://youtu.be/d53B3-zV2ec

G042 Lesson 12-Four terminals network.zip

http://youtu.be/HCO4P1qrPbA

G042 Lesson 13-Exercises.zip

http://youtu.be/LeyJf1PhpCY

Power References

http://electricaldiploma2013.zoomshare.com/files/powerreference.htm

Advanced Diploma in Electrical Engineering Exercises

Click HERE

Assessment Mapping - Template

(streamlined training package)

This template to be used for "new" endorsed streamlined training packages.

Instruction for use: These instructions in RED should be deleted from the completed document. Instructions in **BLUE** should be written over with appropriate information.

- This template is to be completed by the assessment developer to ensure the assessments meet the training package requirements for the unit of competency.
- It must be used during the assessment validation process.
- Record of this document must be retained in the faculty TAS teamshare teaching section.
- Add rows and columns as required below.

This document should be viewed concurrently with IS73 Assessment Mapping.pdf

Click HERE

Faculty:	Construction, Engineering & Transport (CET)	**College:**	
Teaching Section:	Electrical Engineering		
Qualification Number and Name:	Advanced Diploma of Engineering Technology-Electrical/ Advanced Diploma of Electrical Engineering		
Unit of Competency Number and Name:	**UETTDRIS73A Develop engineering solutions for energy supply power transformer problems**		

Copy and paste the following table for each element as required

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
1 Prepare to diagnose and rectify faults. Work performance	1.1	OHS procedures for a given work area are identified, obtained and understood	Q 1 to 3 of IS73 Assessment Mapping.pdf Page 1		
	1.2	OHS risk control measures and procedures in preparation for the work are followed			Advanced Diploma in Electrical Engineering Exercises Page 3 -Q17+18 Page 4 Q21+22 Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)
	1.3	The extent of the transformer problem is determined from performance specifications and situation reports and in consultations with relevant persons.	Q 1 to 4 of IS73 Assessment Mapping.pdf Page 2		
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.	Q 9 to 12 of IS73 Assessment Mapping.pdf Page 3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently.			Advanced Diploma in Electrical Engineering Exercises Page 208) Q11+12
2 Develop engineering solutions for energy supply power transformer problems.	2.1	OHS risk control measures and procedures for carrying out the work are followed.	As per 1.3		
	2.2	Knowledge of supply power transformer arrangements, operation, device characteristics and applications are applied to developing solutions to supply power transformer problem			Advanced Diploma in Electrical Engineering Exercises Page 135,136,) Q 8,12,22
	2.3	Parameters, specifications and performance requirements in relation to each transformer problem are obtained in accordance with established procedures.			Advanced Diploma in Electrical Engineering Exercises Page 138,) Q 25 to 27
	2.4	Approaches to resolving supply power transformer problems are analysed to provide most effective solutions			Advanced Diploma in Electrical Engineering Exercises Page 135,) Q 5 to 7 Advanced Diploma

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
					in Electrical Engineering Exercises Page 141) Q39 to 44
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.			Advanced Diploma in Electrical Engineering Exercises Page 211 Q50 to 54
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.			As above
3.Test, document and implement engineering solution for energy supply power transformer problems.	3.1	Solutions to transformer problems are tested to determine their effectiveness and modified where necessary.			Advanced Diploma in Electrical Engineering Exercises Page145) Q64 to 72
	3.2	Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.			Advanced Diploma in Electrical Engineering Exercises Page145) Q73 to 80
	3.3	Appropriately competent and qualified person(s) required to implement solutions to supply power transformer problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)	Practical TR1, Tr2,Tr3		

Elements & Performance Criteria			Assessment event(s)		
Element(s)	**PC No**	**Performance Criteria (PC)**	**Assessment event 1 Written Test**	**Assessment event 2 Practical & Observation**	**Assessment event 3 Assignment**
	3.4	Justification for solutions used to solve supply power transformer problems is documented for inclusion in work/project development records in accordance with professional standards.	Practical TR4		

Add rows to the following table as required

Performance Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
Transformer polarity test		Practical TR1	
Three phase transformer connection & vector group		Practical TR2	
Transformer parallel operation		Practical TR3	
Transformer winding design		Practical TR4	

Add rows to the following table as required

Knowledge Evidence	Assessment event 1 Written Test	Assessment event 2 Practical & Observation	Assessment event 3 Assignment
T1 Transformer construction and operating principles	Q1,2 of Test 1		
T2 Transformer parameters	Q 3,4 of Test 1		
T3 Cooling methods			Advanced Diploma in Electrical Engineering Exercises Page145) Q73 to 80
T4 Instrument transformers			Advanced Diploma in Electrical Engineering Exercises Page127) Q38 to 52
T5 Transformer connection	Test 2 Q2, Q7		
T6 Parallel operation	Test 2 Q10		
T7 Harmonics in transformers	Test 2 Q8,9		
T8 High voltage isolation			Advanced Diploma in Electrical Engineering Exercises Page124) Q10 to 15

Add rows to the following table as required

Assessment Conditions	Assessment	Assessment	Assessment

	event 1 Written Test	event 2 Practical & Observation	event 3 Assignment
Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the welectrical workshop K2.11. Application of safe working practice & regarding the housekeeping rules are to be observed. Emergency procedures are to be informed. Safety equipments & first aids equipments are to be available. The students get the access to • Relevant practical equipments Records relating to electrical engineering resources	Test 1, 2	Practical TR1, TR2, TR3, TR4	All Assignment Task

Created by (Name)	U Kyaw Naing (Joe)	**Date created**	**16 August 2016**
Approved by (Name)	Michael Moulton	**Date approved**	
Signature		**Date modified**	

UETTDRIS73A Develop engineering solutions for energy supply power transformer problems

ASSESSMENT QUESTIONS & TESTS ARE BASED ON THE FOLLOWINGS,THEY ARE MODIFIED, EXTRACTED SOME PARTS, APPLIED THE SIMILAR ONES,ALTER AND UTILIZED IN ASSESSMENT TASKS & THEORY TESTS FROM TIME TO TIME.

1 Prepare to diagnose and rectify faults. Work performance

1.1 OHS procedures for a given work area are identified, obtained and understood

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q15+16

www.electricaldiploma2013.webs.com Then access Click **HERE** to download the Exercises

http://www.mongroupsydney1.com/Advanced_Diploma_in_Electrical_Engineering_Exercises_EE011.pdf

Relevant Instruction Lessons

Study Option (1)

Guided study (Online)Resources+Online exercises+Online Practicals

Click HERE

&

Youtube Videos for Electrical Engineering Lessons

http://www.mongroupsydney1.com/youtubevideos.htm

Q1.Describe the risks and dangers in power station and outline the recommended safety
Q2.equipments and emergency procedures.
Q3.Outline the process of maintenance work in substation.

1.2 OHS risk control measures and procedures in preparation for the work are followed

Ref-Advanced Diploma in Electrical Engineering Exercises Page 3 -Q17+18 Page 4 Q21+22
Q4. Write down the check list to perform the tasks in substation.
Q5. Write down the safety procedures and methods to assess the risk and to reduce the risk.
Q6..Write down the code of practice for working near exposed main and apparatus.
Q7.Which precautions are to be emphasized when working in substation?

Q8. Write down the risk reduction procedures in maintenance work to discuss with work manager. (Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q12)

1.3 The extent of the transformer problem is determined from performance specifications and situation reports and in consultations with relevant persons.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 135)

(1) Transformer construction
Slide 1
Q1.Sketch shell & core type transformer constructions.
Q2.Write the transformer voltage equation.
Q3.Write voltage, current and turn relations of transformer.
Slide 2
Q4.Calculate iron core flux density & RMS magnetizing current for the following single phase transformer.
Np=500 Ep=2000V (RMS), Core CSA = 100 sq-cm where length = 200 cm Air gap 0.5mm ,μ 0= 1900

1.4 Advice is sought from the work supervisor to ensure the work is coordinated effectively withothers.

Answer the following questions to seek the advice from work supervisor in the following aspects.

Q9. What are the risks?
Q10.How are the risks classified?
Q11.How can the risk be evaluated?
Q12.How will you manage the risk? Ref-Advanced Diploma in Electrical Engineering Exercises Page 2 Q8 to 11)

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1.5Effective strategies are formed to ensure solution development and implementation is carried out efficiently.
Ref-Advanced Diploma in Electrical Engineering Exercises Page 208)

(3) Strategy objective

Slide 1+2
Q11.What are the developing of strategies in project?
Q12.How will you examine the effectiveness of activities in project management?

Location of Evidences (Table 1)

Performnce Criteria	Above	Location of Evidences
Marking Guide/ Assessment Cover/ Feedback own record		Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/IS73 Assessment 1 /Question Marking scheme Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 1/IS73 Assessment 1/ Assessment Cover Sheet Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS73 Assessment 1/ Assessment Feedback Sheet
Students' work in own record	Summative Assessment- Formal Tests	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS73 Assessment 1 / Student Work

	Formative Assessment/Practical+ Class works	Record2016/Students/TAFE/Sem 1-2016/Sem1 2016 Students work Assessment 2/IS73 Assessment 1 / Student Work Record2016/Students/TAFE/Sem 1-2016/Sem1 2016/Sem 1 2016 Attendance Records+Record Book

2 Develop engineering solutions for energy supply power transformer problems.

2.1 OHS risk control measures and procedures for carrying out the work are followed.

As per 1.3

2.2 Knowledge of supply power transformer arrangements, operation, device characteristics and applications are applied to developing solutions to supply power transformer problem

Ref-Advanced Diploma in Electrical Engineering Exercises Page 135,136,)

Slide 5
Transformer equivalent circuit.
Q8.Write the equations to do transformer open circuit and short circuit tests.
Slide 9+10
Q12.A 2000KVA 6600/415V three phase delta/ star transformer %R = 2.8, %X = 6 Maximum efficiency occurs at one third load. Calculate (a) Iron loss (b) Maximum efficiency at 0.9 power factor.

Slide 19
Q22(A).What is per unit rating of power transformer.
Slide 20
Q22(B).Primary turn = 400
Primary voltage = 2400V rms
Frequency = 50HZ
CSA = 300 cm 2 , length of winding = 130 cm. Calculate the magnetic flux density of above single phase transformer.

2.3 Parameters, specifications and performance requirements in relation to each transformer problem are obtained in accordance with established procedures.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 138,)

(3) Transformer equivalent circuit
Slide 1+2

Q25.Explain the principle of operation of power transformer.
Slide 9
Q26.Find primary and secondary current of 5KVA 300/150V single phase transformer.
Slide 10+11
Q27.Explain power losses in transformer

2.4 Approaches to resolving supply power transformer problems are analysed to provide most effective solutions.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 135,)

Q5.Describe transformer cooling.
Q6.How will you check the polarity to operate transformers in parallel.
Q7.Transformer A, rated 10MVA, %Za = 1+j2 %
Transformer B, rated 20MVA %Zb = 2+j3%
(a) Calculate % Z of 20MVA transformer based on 10MVA.
(b) MVA supplied by each transformer when they are supplying 15MVA unity PF.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 141)

Q39.Np = 500, Ns = 100, Rp = 0.2Ω, Rs =0.015Ω, Xp=0.1Ω, Xs=0.4Ω, Vp= 2000V, Vs= 500V
Find Zeq ' . Vs ' , % Regulation for 0.9 PF lagging, % Regulation for 0.95 PF leading
Q40.Write the equation for % regulation at maximum efficiency.
Slide 6
Q41.If % R = 4 % X=6 Find % Regulation at PF lagging.
Slide 7
Q42.Write the equation for transformer loss and efficiency.
Slide 8+9
Q43.Single phase 6000KVA transformer 7000/450V Iron loss = 3 KW , Full load copper loss 5 KW .
Find (a) % Efficiency at full load 0.9 pF lagging (b) % Efficiency at half load 0.9 PF lagging.
Slide 10+11
Q44.Find the load at maximum efficiency of the following single phase transformer. KVA = 2000,
Voltage ratio = 7000/500, Iron loss = 5 KW, Full load copper loss = 7KW, Maximum efficiency is
achieved at 0.7 PF lagging.

2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy.

2.6 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.

Ref-Advanced Diploma in Electrical Engineering Exercises Page 211)

(11) Change control
Slide 1
Q50.Describe the overview of change control system.
Slide 2
Q51.Explain the establishment of contracts
Slide 3
Q52.Outline the project control system responding the disturbances.
Slide 4
Q53.Sketch the procedure for preparing quality manual.
Slide 5+6
Q54.Explain management leadership.

3 Test, document and implement engineering solution for energy supply power transformer problems.

3.1 Solutions to transformer problems are tested to determine their effectiveness and modified where necessary.

Ref-Advanced Diploma in Electrical Engineering Exercises Page145)

(10) Unbalanced load+ Parallel+ Cooling +Tap changing+ Efficiency
Slide 1+2+3
Q64.Describe briefly the various stages of on-load tap changers used in power system.
Q65.List two fundamental features of no load tap changing circuits.
Slide 4
Q66.Briefly describe the effect of tap changing on the limitation of power system operation.
Slide 5+6+7
Q67.2000KVA, 6600/415V three phase delta/ star transformer %R=2 %X=5 Maximum efficiency occurs at 1/3 load
Calculate (a) Iron loss (b) Full load efficiency at 0.9 PF lagging (c) Maximum efficiency at 0.7 PF lagging.
Slide 8
Q68.How does the unbalanced load on three phase transformer cause the magnetomotive force in it?
Slide 9
Q69.Describe the examples of unbalanced loading

Slide 11
Q70.What are the requirement for parallel operation of three phase transformers
Slide 12+13+14

Q71.Tr A = 3+j6 % 15MVA , Tr B= 4+j8 % 25MVA
Calculate
(a) % Impedance of 25 MVA transformer to base 15MVA
(b) MVA supplied by each transformer if load is 20 MVA at unity PF.
Slide 15+16
Q72.Do the exercises on slide 15+16

3.2 Adopted solutions are documented including instruction for their implementation that incorporates risk control measure to be followed.

Ref-Advanced Diploma in Electrical Engineering Exercises Page145)

(11) Rating + Conservator system
Slide 1+2+3
Q73.Sketch the following cooling arrangements : AN, AF, ONAF, OFAF, ONAN, OFWF
Slide 4
Q74.Briefly describe the methods used in measuring oil and winding temperatures.
Slide 5
Q75.Describe the construction and use of dry type transformer.
Q76.List two types of windings used in dry type
Q77.List the requirements for oil in oil immersed transformer
Q78.List the important characteristics for oil testing
Slide 6+7+8
Q79.Describe the tests to determine the characteristics of transformer.
Slide 9
Q80.Describe dissolved GAS analysis (DGA) of insulating oil.

3.3 Appropriately competent and qualified person(s) required to implement solutions to supply power transformer problems are coordinated in accordance with regulatory requirements and enterprise policy. (Note)

3.4 Justification for solutions used to solve supply power transformer problems is documented for inclusion in work/project development records in accordance with professional standards.

Part 1: Operational Study

Lab No	Name of Practical	IS73 Equipments	Assessment
TR1	Transformer polarity test	• distributor equipment	Practical Observation