



**Construction, Engineering and
Transport Faculty**

Assessment

UEPOPS428B - Develop H.V. switching programs

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UEPOPS428B - Develop H.V. switching programs

Assessment feedback sheet

Qualification:	Statement of Attainment – HV Switching
Unit of Competency:	UEPOPS428B - Develop H.V. switching programs
Assessment Task:	
Student Name:	
Student ID:	

Assessment Outcome:	For UOC being assessed by multiple assessment activities, each activity will be reported as Satisfactory or Not Satisfactory <input type="checkbox"/> [Satisfactory] <input type="checkbox"/> [Not Satisfactory] <input type="checkbox"/> Resubmission (RS)		
	For UOC being assessed for the final result it will be reported as AC (Competent) or NC (Not yet competent) <input type="checkbox"/> [Competent - AC] <input type="checkbox"/> [Not Yet Competent-NC] <input type="checkbox"/> Resubmission (RS)		
Assessor's comment regarding student performance			
Assessor's comment should be specific and based on the marking criteria for the specific assessment event.			
Assessor's recommendation on how to improve the performance (if there is any gap)			
Assessor's comment should be specific and based on the marking criteria for the specific assessment event.			
Assessor Name/ Signature:			Date:
Student Feedback on Outcome(s):			
<input type="checkbox"/> The results of my performance have been discussed and explained to me. If you would like to request a review of your results or if you have any concerns about your results, contact your teacher or head teacher.			
Student's signature:		Date:	

UEPOPS428B - Develop H.V. switching programs

Participant confirmation

Participant confirmation:		
By signing below, I confirm that:		
<input type="checkbox"/> I have enrolled to undertake the assessments indicated above; and <input type="checkbox"/> The assessment criteria has been explained to me and I am aware that I will be assessed against the criteria outlined within the attached assessment documents. <input type="checkbox"/> I have been given fair notice of the date, time & venue for this assessment, and I am aware of my rights and obligations in relation to the assessment process <input type="checkbox"/> I am satisfied that the assessment was fair and valid.		
Student Name (please print):		
Student Signature:		Date: / /
Student Identification Please provide Photo ID for verification by the Assessor	Drivers Licence State of Issue:	Number:
	High Risk Licence State of Issue:	Number:
ESI Network Authorisations: <input type="checkbox"/> Ausgrid <input type="checkbox"/> Endeavour Energy <input type="checkbox"/> Essential Energy		
UEPOPS428B - Develop H.V. switching programs: (Assessor Use Only)		
Assessment component	Assessment outcome	
UEPOPS428B - Theory/Knowledge Assessment	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Not satisfactory
UEPOPS428B - Practical/Oral Assessment	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Not satisfactory
Overall Assessment Outcome – UEPOPS428B	<input type="checkbox"/> Competent	<input type="checkbox"/> Not Competent
Trainer/Assessor Name (please Print):		
Trainer/Assessor Signature:		
Date of Assessment:		

Assessment resource - version and publication:

Title	[Title]		
Publication authorised by	Nicholas Blanch	Issued version number	[Status]
Date issued	[Publish Date]	Date for review	23/09/2017
Document Repository			

Assessment resource - publication history:

Previous Versions	Current Version	Date	Author	Description of change
	V1.0			Initial Version

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Assessment

Assessment Instructions:

To successfully complete this assessment and be 'deemed' competent participants must:

- answer **all** knowledge assessment questions contained within the written assessment resource to the satisfaction of the assessor.
- Achieve a minimum mark of 100% (i.e. **all answers must be correct**). Each un-answered question is to be marked as incorrect).

Assessment participants may not access any reference material during this part of the assessment

Nominal assessment duration: 20 minutes

Question 1: (Tick the most correct answer – 2 Marks)

From the table below identify those voltages which would be considered to be 'Low Voltage' according to your organisation's electrical safety rules.

Voltage Levels	Considered to be Low Voltage under the Electrical Safety Rules (Yes/No)	
a) Any voltage 12 volts and 40 volts AC	<input type="checkbox"/> Yes	<input type="checkbox"/> No
b) Any voltage between 12 volts and 110 volts DC	<input type="checkbox"/> Yes	<input type="checkbox"/> No
c) Any voltage between 50 volts and 1000 volts AC	<input type="checkbox"/> Yes	<input type="checkbox"/> No
d) Any voltage between 120 volts and 1500 volts DC	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Question 2: (Circle the most correct answer – 2 Marks)

From the items listed below select the most appropriate definition for 'authorised person'

- A person who has acquired through training, qualification, experience, or a combination of them, the knowledge and skills to carry out the task.
- A person who has attained a relevant nationally recognized qualification, and who has been licensed by the NSW Department of Fair Trading
- A person with technical knowledge or sufficient experience who has been approved, or has the delegated authority to act on behalf of the Network Operator, to perform the duty concerned.
- LV or HV overhead conductors which are protected by physical barriers to prevent persons encroaching within the relevant Safe Approach Distances (SADs).

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Question 3: (2 Marks)

In the spaces provided below, write down the five (5) different types or categories that WHS hazards can generally be classified into:

1. Hazards
2. Hazards
3. Hazards
4. Hazards
5. Hazards

Question 4: (8 Marks)

In the spaces provided below write down the definition for each of the terms

- a) De-energised
- b) Isolated
- c) High Voltage

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Question 5: (2 Marks)

From the table below identify those voltages which would be considered to be 'High Voltage' according to your organisations electrical safety rules.

a) Any voltage exceeding 1 000 volts AC	<input type="checkbox"/> Yes	<input type="checkbox"/> No
b) Any voltage between 1 500 volts and 11 000 Volts AC	<input type="checkbox"/> Yes	<input type="checkbox"/> No
c) Any voltage exceeding 1 500 volts DC	<input type="checkbox"/> Yes	<input type="checkbox"/> No
d) Any voltage between 1000 volts and 1500 volts DC	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Question 6: (4 Marks)

In the spaces provided below write down the definition for each of the terms:

a) Electrical Apparatus

b) Earthed

Question 7 (6 Marks)

In the spaces provided below write down three (3) common types of HV circuit breaker arc extinguishing mechanisms which may be used within HV circuit breakers.

- a)
-
- b)
-
- c)
-

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Question 8: (Circle the most correct answer – 2 Marks)

Ground-overcurrent or 'earth fault' protection is used to detect earth faults whereby:

- a) the current in a specific neutral or earth conductor is measured
- b) the residual current of the phase conductors of a 3 phase system is measured
- c) the current in a phase conductor is measured.

Question 9: (Circle the most correct answer – 2 Marks)

A differential protection scheme:

- a) Compares the current entering the protected circuit (or zone) to the current leaving the zone
- b) Measures the residual current of the phase conductors of a 3 phase system is measured
- c) Measures the current within a specific neutral or earth conductor connected between the mass of earth and the transformers star point.

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Question 10: (6 Marks)

Review the single line network diagrams below, and complete the table by ticking the box next to the most correct answers

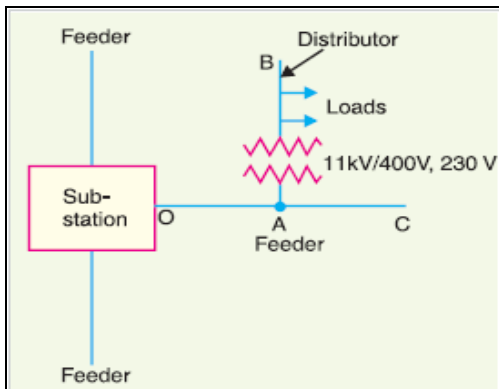


Figure A

- ☐ Radial Network
- ☐ Ring Main Network
- ☐ Interconnected Network

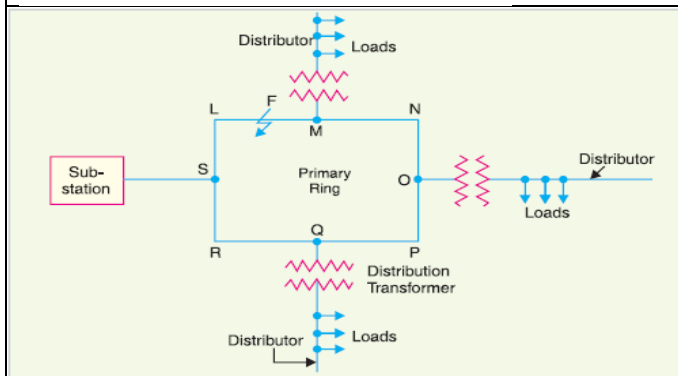


Figure B

- ☐ Radial Network
- ☐ Ring Main Network
- ☐ Interconnected Network

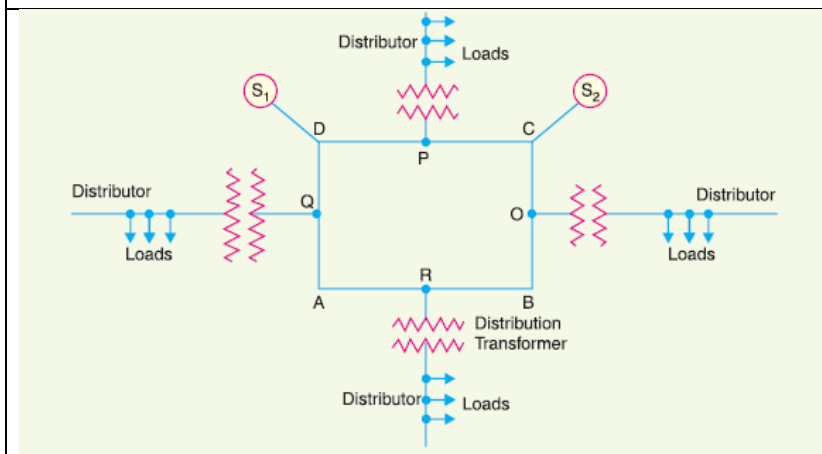


Figure C

- ☐ Radial Network
- ☐ Ring Main Network
- ☐ Interconnected Network

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Question 11: (Circle the most correct answer – 2 Marks)

Which statutory requirement states that it is the employer's responsibility to provide such information, instruction, training and supervision necessary to ensure the health and safety at work of all employees?

- a) NSW Occupational Health and Safety Regulation 2001
- b) NSW Workers Compensation act 2011
- c) NSW Occupational Health and Safety Regulation 2010

Question 12: (Circle the most correct answer – 2 Marks)

Voltage fluctuations are short duration variations in voltage levels due to changes in, or switching of loads within the supply network.

- a) True
- b) False

Question 13: (Circle the most correct answer – 2 Marks)

From the items listed below, choose the most correct definition for the term 'Risk':

- a) The likelihood of any harm or Injury happening
- b) The potential for harm or injury to occur at the worksite
- c) Anything that could cause harm or injury to persons at the work site.

Question 14: (Circle the most correct answer – 2 Marks)

Voltage 'transients' within the electricity distribution network.

- a) are short duration 'spikes' or sudden increases in the supply voltage level generally due to effect of lightning strike upon the distribution network and/or network switching.
- b) A substantial voltage transient will only occur if the lightning strikes the local network or in the immediate vicinity
- c) Switching transients are short-term distortions (milliseconds) to the voltage waveform caused by switching operations
- d) May be limited by the installation of lightning protection systems (including surge arresters, and earthing systems) and protective equipment for rapid isolation of faults.

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Question 15: (6 Marks)

In the spaces provided below write down six (6) general steps used for isolation of HV equipment within a RADIAL HV network:

- 1)
- 2)
- 3)
- 4)
- 5)

Question 16: (2 Marks)

Under your organisation's HV electrical safety rules, what is the safe approach distance/minimum safe working distance (in mm) that an Authorised PERSON must maintain from any uninsulated part of their body to any exposed conductor with voltage of between 1 000 volts and 11 000 volts **AC**?

.....mm

Question 17: (Circle the correct answers – 3 Marks)

Which of the items below best describes Voltage 'regulation' within the electricity distribution network?

- a) Voltage regulation is the maintenance of the distribution system voltage within a specified upper and lower limit bandwidth to ensure quality of power supply to the consumers
- b) Voltage regulation is intended to respond quickly to voltage drops or rises within the distribution network associated with load fluctuation to ensure that customers voltage level do not exceed specified upper or lower limits
- c) Voltage regulation is achieved by the use of distribution transformers fitted with off load tapchangers
- d) Voltage regulation is generally controlled at a zone substation by the transformer supplying the HV distribution system by an Off Load Tap Changer.

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Question 18: (3 Marks)

Under your organisation's HV electrical safety rules, what is the safe approach distance/minimum safe working distance (in mm) that an HV Aware (Instructed) PERSON must maintain from any uninsulated part of their body to any exposed conductor with voltage of up to 1 000 volts DC?

.....mm

Question 19: (Select the most correct answer– 1 Marks)

The basic safety rule for work on or near High Voltage exposed electrical apparatus states that:

- a) The exposed HV conductors or electrical apparatus must be regarded as alive until advised to the contrary by an Authorised Person
- b) The exposed HV conductors or electrical apparatus must be regarded as alive until isolated, proved de-energised and earthed
- c) The exposed HV conductors or electrical apparatus must be regarded as alive until a clear and visible break, signifying isolation, has been established
- d) The exposed HV conductors or electrical apparatus must be regarded as alive until isolated, proved de-energised, earthed and short-circuited by an approved means.

Question 20: (1 Mark)

Insert the correct Safe Approach Distances in the table below

Safe Approach Distance to exposed conductor (MAD) *	Authorised Persons APC, PIC, CP, Safety Observer	HV aware (instructed) persons
Nominal phase to phase voltage	Safe Approach Distance (mm)	Safe Approach Distance (mm)
LV, below 1 kV ac		
LV, below 1 kV dc		
HV, up to 11kV ac		
Safe Approach Distance to insulated conductor		
LV , below 1 kV ac and dc		
HV, up to 11kV ac		
Safe Approach Distance to enclosed conductor (HV and LV)	Arc Flash Protection Boundary	Arc Flash Protection Boundary

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Question 21: (Select the most correct answers– 2 Marks)

Within an electricity transmission or distribution network, faults are generally classified as:

- a) Open circuit faults
- b) Short circuit faults
- c) Expensive or inexpensive faults
- d) Earth faults
- e) Major, minor or insignificant faults
- f) Symmetrical or unsymmetrical faults

Question 22: (Circle the most correct answers – 3 Marks)

From the list below, select the item/s which the Access Permit/Access Authority issuer must advise the Access Permit/Access Authority Recipient (and preferably all persons working on equipment or job for which the Authority is being issued):

- a) a confirmation of the description of the work to be carried out;
- b) the time and date of issue of the access permit/access authority.
- c) the locations where electrical apparatus has been earthed and short-circuited
- d) warnings of adjacent live exposed conductors or electrical apparatus (if applicable)
- e) any screens, tapes / barriers that are erected to define the Work Area.

Question 23: (Circle the most correct answer – 2 Marks)

From the list of items below select an example of a distribution network open circuit fault:

- a) Loss of one phase of a three phase supply due to a blown fuse
- b) Loss of two phases of a three phase supply due to a damaged distribution transformer winding.

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Question 24: (Circle the most correct answer – 2 Marks)

From the list below, select the item/s that the Access Permit/Access Authority Issuer has a responsibility to confirm prior to issuing the access permit/access authority:

- a) Personally check over the precautions that have been taken to ensure that the high voltage has been de energised and totally isolated from any supply
- b) Confirm the high voltage access permit detail to ensure that the electrical apparatus descriptions are correct and in accordance with established labels
- c) Erect appropriate and adequate warning signs and barriers. Discuss with the access permit recipient/holder, the work to be done to ensure that the high voltage access permit covers sufficient electrical apparatus to enable the intended work to be performed safely.
- d) Discuss with the access permit recipient/holder, the work to be done to ensure that the high voltage access permit covers sufficient electrical apparatus to enable the intended work to be performed safely.
- e) Ensure that the access permit recipient/holder understands the location and labelling of any earths to be applied by the work party, which are to be listed on the high voltage access permit and that this understanding agrees with the operator's understanding.

Question 25: (Circle the most correct answer – 3 Marks).

- a) From the list of items below select those which best describe a distribution network short circuit faults:
- b) An abnormal connection of very low impedance between two points of different potential, whether made intentionally or accidentally
- c) Can only occur where there has been an insulation failure between conductors
- d) Three phase short circuit faults clear of earth and three phase fault to earth are balanced or symmetrical faults while other remaining faults are unsymmetrical faults.
- e) Are faults which result in the flow of abnormal high currents through the equipment or transmission/distribution lines.

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Question 26: (Circle the most correct answer – 3 Marks).

All sections of this question must be answered correctly.

From the list of items provided below select those which best describe a symmetrical or balanced fault :

- a) A fault which gives rise to symmetrical fault currents that are displaced with 120 degrees from each other.
- b) Can only occur where there has been an insulation failure between conductors
- c) A fault which occurs when all the three phases are simultaneously short circuited.
- d) A fault which results in a short circuit between line to line to line (L-L-L) and line to line to line to ground (L-L-L-G).

Question 27: (Select the most correct answers– 2 Marks)

In the space provided below, describe the circumstances under which the Permit To Work/Access Permit/Access Authority recipient can refuse to accept a Permit To Work/Access Permit/Access Authority.

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Question 28: (Select the most correct answers– 2 Marks)

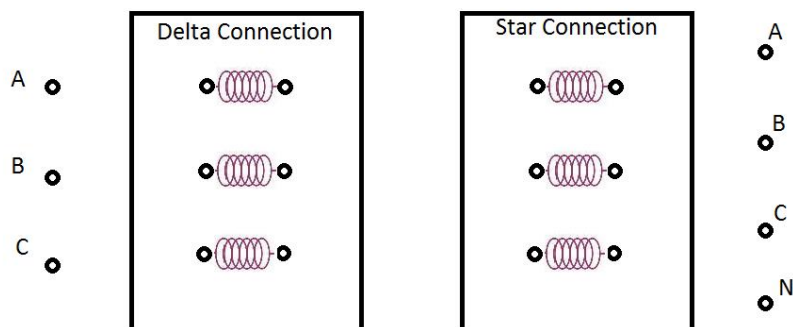
- a) Unsymmetrical distribution system faults:
- b) Are more common and less severe than symmetrical faults
- c) Consist of mainly three types of faults, namely line to ground (L-G), line to line (L-L) and double line to ground (LL-G) faults.
- d) Are less common and more severe than symmetrical faults
- e) Are also called unbalanced faults since their occurrence causes unbalance in the system (i.e. fault impedance values are different in each phase causing unbalance current to flow in the phases)

Question 29: (Circle the most correct answer – 3 Marks).

All sections of this question must be answered correctly.

The diagram below represents the primary and secondary windings of three phase HV – LV distribution transformer. Complete the diagram by drawing the following:

- a) Correct connections between each of the 11Kv transformer windings to create a 'DELTA' connection of the transformer primary windings
- b) Correct connections between each of the LV transformer windings to create a 'STAR' connection of the transformer Secondary windings.
- c) Correct connections between the HV transformer terminals (marked A, B, C) and the DELTA connected transformer primary winding
- d) Correct connections between the LV transformer terminals (marked A, B, C, N) and the STAR connected transformer Secondary winding



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Question 30: (3 Marks).

All sections of this question must be answered correctly

Referencing the circuit breaker diagram provided below, complete the table provided by identifying of the main components of the circuit breaker:

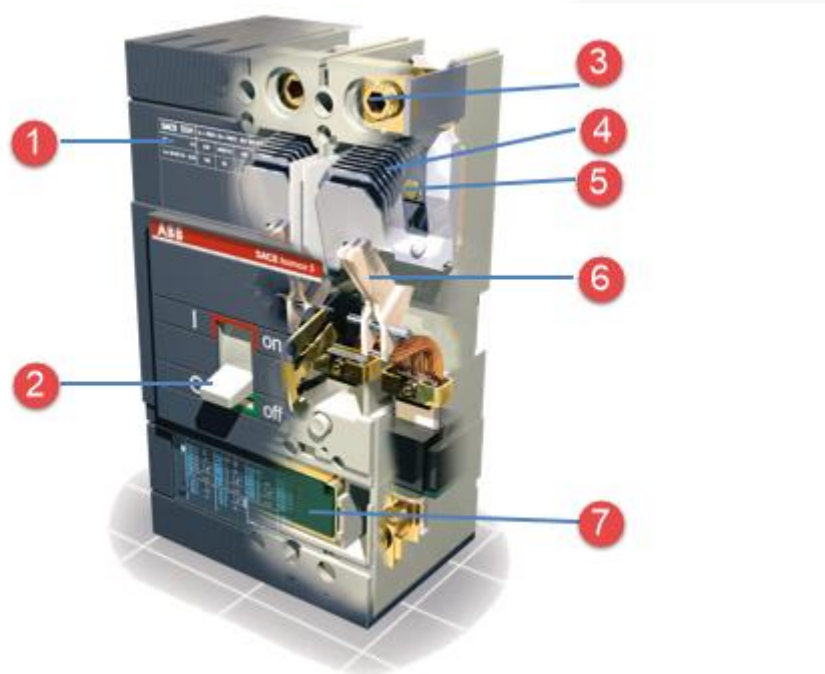


Diagram number	Circuit breaker components description
1	
2	
3	
4	
5	
6	
7	

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Question 31: (Select the most correct answers– 2 Marks)

Assume you have been provided a current transformer with a ratio of 200/5. If the primary current passing through this CT was 180 amps, the secondary current would be:

- a) 10 amps
- b) 2 amps
- c) 5 amps
- d) 180 amps
- e) 36 amps
- f) 4.5 Amps

Question 32: (Select the most correct answers– 2 Marks)

In the spaces provided below, briefly describe who can receive a Permit To Work/Access Permit/Access Authority under the requirements of your organisations HV electrical safety rules

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Question 33: (2 Marks)

What would the value of current flow (in amperes) through a person who is in contact with a 6.6 kV HV uninsulated conductor if we assume that the total resistance of the circuit through the person's body and to earth is 24 000 Ohms?

Answer:

Question 34: (6 Marks)

Describe the definition of High Voltage (HV) in terms of a voltage level:

.....

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.....

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Question 35: (Circle the most correct answer(s) – 5 Marks)

Identify which of the items listed below **could be are considered to be** electrical stresses which can potentially generate a stator winding fault within a HV AC induction motor:

- a) Supply voltage transients, due to lightning, opening, or closing of circuit breakers or due to variable frequency drives
- b) Coil movement due to the stator current loosening the top sticks and also may cause damage to the copper conductor and its insulation.
- c) Supply under-voltage or over-voltage conditions
- d) Stator lamination failure
- e) Stator winding slot insulation failure

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Question 36: (2 Marks)

Under your organisation's HV electrical safety rules, what is the safe approach distance/minimum safe working distance (in mm) that an Authorised Person must maintain from any uninsulated part of their body to any exposed conductor with voltage of between 1 000 volts and 11 000 volts **AC**?

..... mm

Question 37: (3 Marks)

Under your organisation's HV electrical safety rules, what is the safe approach distance/minimum safe working distance (in mm) that an HV Aware (Instructed) Person must maintain from any uninsulated part of their body to any exposed conductor with voltage of up to 1 000 volts **AC**?

.....mm

Question 38: (Insert the missing words in the space provided – 3 Marks)

Under your organisation's HV electrical safety rules, what is the safe approach distance/minimum safe working distance (in mm) that an HV Aware (Instructed) PERSON must maintain from any uninsulated part of their body to any exposed conductor with voltage of up to 1 000 volts DC?

.....mm

Question 39: (Circle the most correct answer – 2 Marks)

In a low voltage distribution system, the term Multiple Earthed Neutral System incorporates:

- a) A system where the neutral conductor is earthed at various points along its length
- b) A method of maintaining the neutral substantially at earth potential at any point on the conductor
- c) The consumer's main earth is connected to the neutral link in the customer's main switchboard
- d) A method of maintaining the neutral at earth potential on the consumer's premises
- e) All of the above.

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Question 40: (Circle the most correct answer – 2 Marks)

HV Electrical Electricity Distribution equipment is deemed to be isolated if it has been:

- a) Separated from all possible sources of electrical energy by means which prevent unintentional energisation of the electrical apparatus and which is assessed as a suitable step in the process of making safe for access purposes
- b) Connected to the general mass of earth by a conductor to ensure and maintain the effective dissipation of electrical energy, for the purposes of making safe for access
- c) Disconnected from the Low Voltage Network via the Low Voltage fuses, which have been opened and removed so that there can be no possible energisation
- d) Assessed as being safe by an Authorised Person and Working Earths have been applied within sight of the working area
- e) Out of service or de-commissioned.

Question 42: (Circle the most correct answer – 2 Marks)

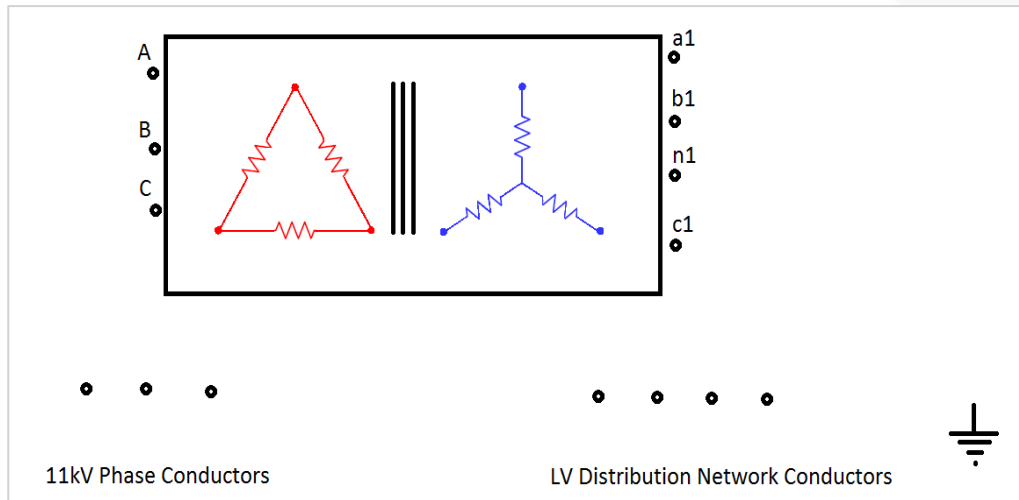
The basic principles for Safe Electrical Work Practices are:

- a) All low voltage electricity works shall be regarded as live until isolated, proved de-energised according to approved procedures
- b) The Authorised employee carrying out the electricity works should hold a National Competency Certificate in Workplace training and assessment
- c) All high voltage electricity works shall be regarded as live until isolated, proved to be de-energised, earthed and short circuited and an Access Permit is issued.
- d) All of the above
- e) Both (a) and (c) above

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Question 43: (Circle the most correct answer – 2 Marks)

To ensure safety of personnel undertaking maintenance on or near HV electrical equipment, High voltage apparatus must be regarded as alive until:



- a) It has been isolated
- b) It has been proven to be de-energised
- c) It has been earthed
- d) It has been short circuited by a means approved by the Network Operator
- e) An access permit has been issued to a person authorised to receive an access permit
- f) All of the above.

Question 44: (16 Marks)

The diagram below represents a Delta/Star connected three phase HV – LV distribution transformer. Complete the diagram by drawing the following:

- a) Correct connections between the 11Kv phase conductors and the HV terminals marked A, B, C
- b) Correct connections between HV terminals and the Transformer Primary Winding.
- c) Correct connections between the Transformer Secondary Winding and the LV terminals marked a1, b1, n1, c1
- d) Correct connections between the LV terminals marked a1, b1, n1, c1 and the LV distribution conductors and earth

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Question 45: (Complete the calculations – 12 Marks)

Assuming the transformer in the diagram on the previous page has a phase to phase voltage of 11 000 volts being supplied to its primary winding, has a transformer ratio of 27.5 and has 6 Amps flowing in the primary winding, calculate the following:

- a) The Phase to Earth Voltage for the 11kv conductors supplying the primary winding of the transformer
- b) The Phase to Phase voltage between the LV conductors of the transformer secondary winding.
- c) The load current being drawn from the transformer secondary winding.

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- d) The phase to earth voltage of the LV conductors connected to the transformer Secondary Winding.

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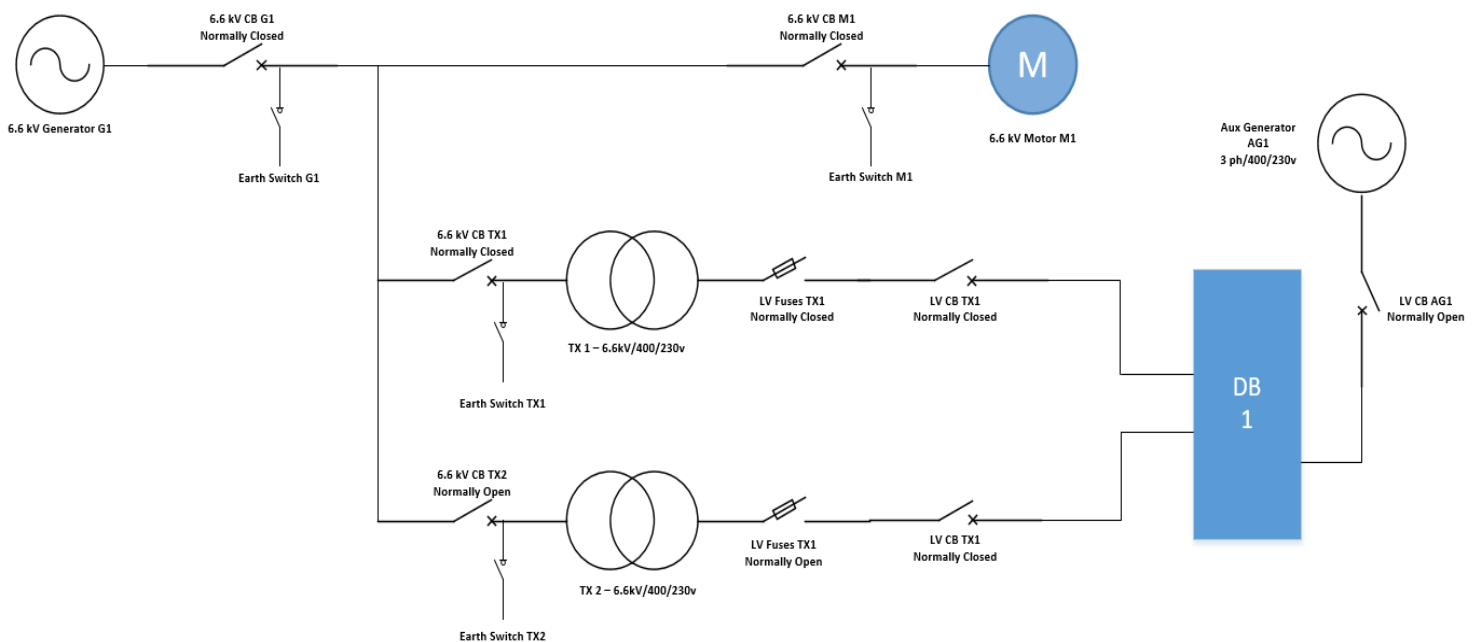
Question 46: (Complete the calculations – 12 Marks)

Refer to the single line/schematic diagram below, and using the table provided on the following page, develop a 'step by step' switching instruction which meets the following six key criteria:

1. Isolate LV Distribution Board DB1 from Transformer TX1
2. Ensure no interruption in supply to Distribution Board DB1 and maintain load fed from Distribution Board DB1 via Auxiliary Generator AG1
3. De-energise Transformer TX1
4. Isolate Transformer TX2 from Generator G1 and Distribution Board DB1 to allow maintenance to be carried out on both HV primary cable connections and LV secondary connections.
5. Ensure no interruption in supply to 6.6 kV motor M1

For the purposes of this exercise, assume:

- That there is no Automatic Voltage Regulation (AVR), nor any Automatic Transformer Selection/Change-Over systems present.
- That TX1, TX2 and Auxiliary Generator AG1 have load indicating instruments (ammeters) available to monitor 3 phase LV load.
- That Distribution Board DB1 and Auxiliary Generator AG1 have indicating instruments to monitor 3 phase voltages phasing and phase rotation.



[illegible]

Question 46 – Switching Instruction:

[illegible]

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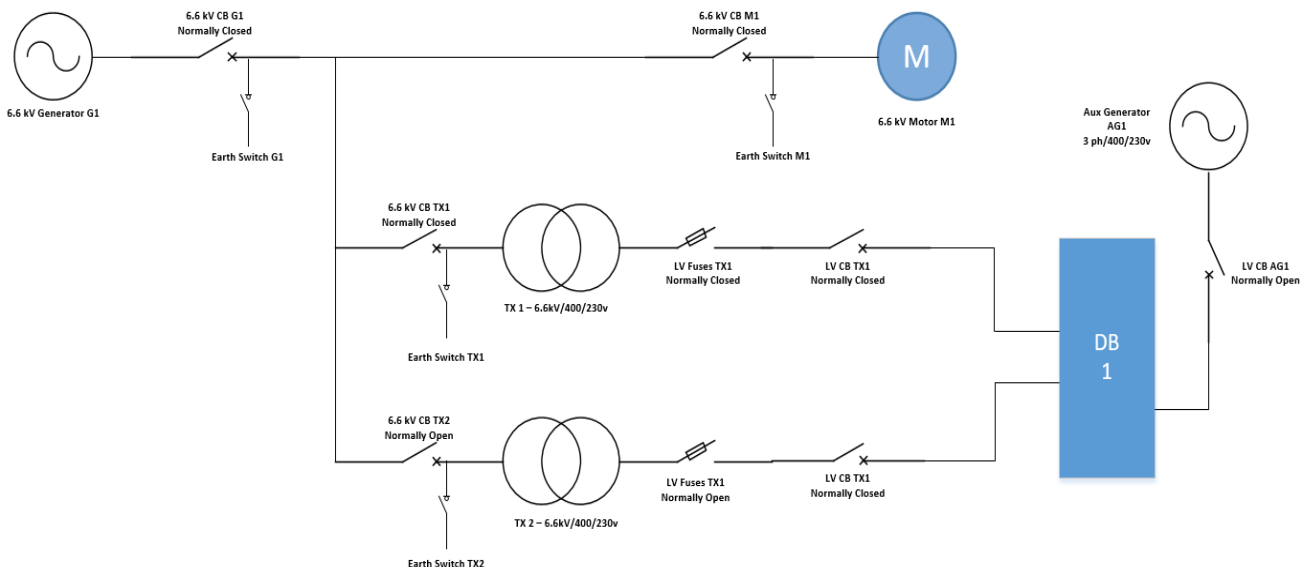
Question 47: (Complete the calculations – 12 Marks)

Refer to the single line/schematic diagram below, and using the table provided on the following page, develop a 'step by step' switching instruction which meets the following key criteria:

- Isolate LV Distribution Board DB1 from Transformer TX1
- Ensure no interruption in supply to Distribution Board DB1 and maintain load fed from Distribution Board DB1 via Transformer TX2
- Isolate Transformer TX1 from Generator G1 and Distribution Board DB1 to allow maintenance to be carried out on both HV primary cable connections and LV secondary connections.
- Ensure no interruption in supply to 6.6 kV motor M1

For the purposes of this exercise, assume:

- That all HV circuit breakers are of a 'rack down and removable truck' type
- That there is no Automatic Voltage Regulation (AVR), nor any Automatic Transformer Selection/Change-Over systems present.
- That TX1, TX2 and Auxiliary Generator AG1 have load indicating instruments (ammeters) available to monitor 3 phase LV load.
- That Distribution Board DB1 and Auxiliary Generator AG1 have indicating instruments to monitor 3 phase voltages phasing and phase rotation.



[illegible]

Question 47 – Switching Instruction:

[illegible]

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Question 48: (Complete the calculations – 12 Marks)

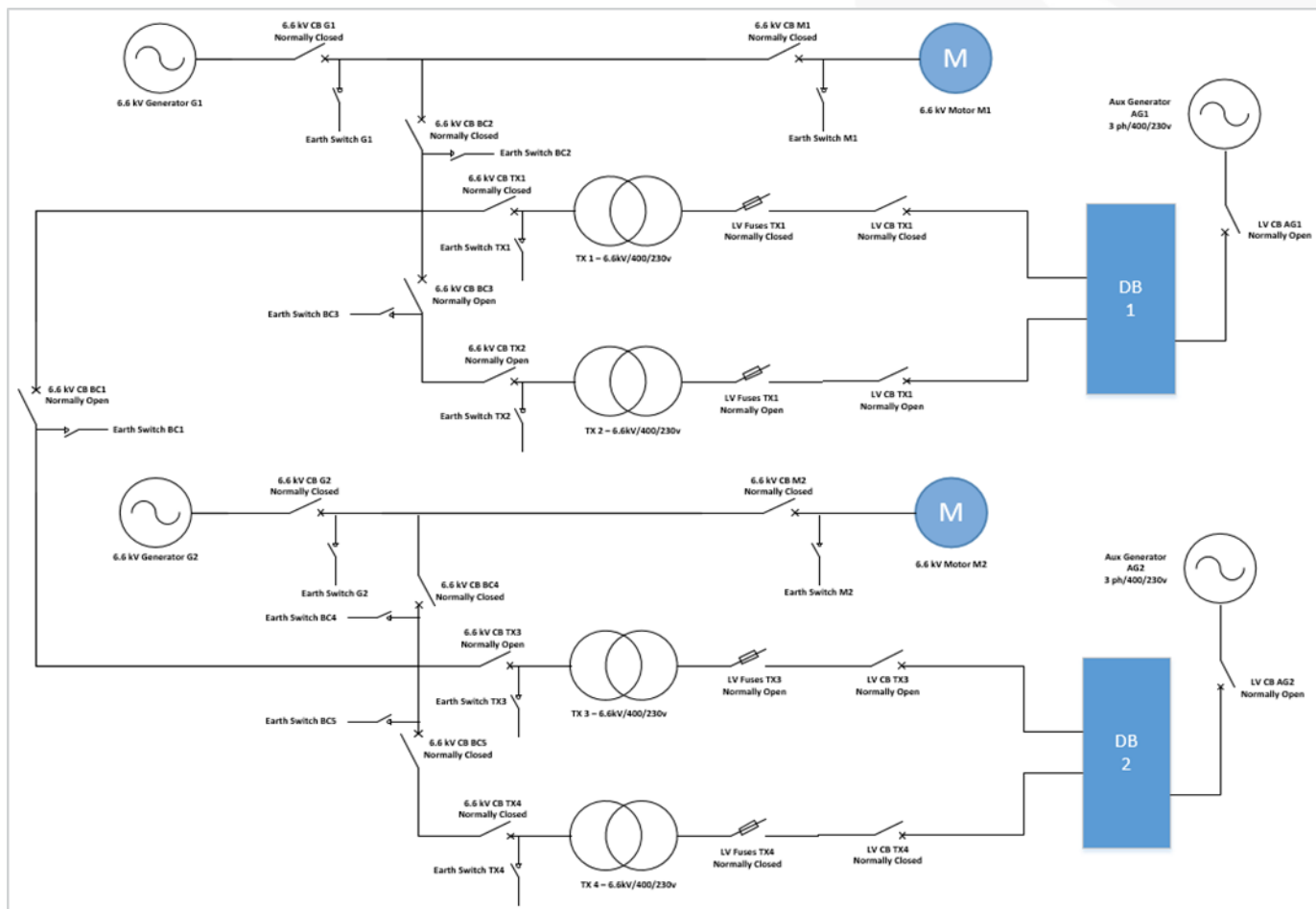
Refer to the single line/schematic diagram below, and using the table provided on the following page, develop a 'step by step' switching instruction which meets the following key criteria:

- a) Isolate 6.6 kV Generator G1
- b) Ensure no interruption in supply to 6.6 kV Motor M1 or Distribution Board DB1, and maintain load fed from Distribution Board DB1 via Transformer TX2
- c) Isolate Transformer TX4 from Generator G2 and Distribution Board DB2 to allow maintenance to be carried out on both HV primary cable connections and LV secondary connections.
- d) Ensure no interruption to 6.6 kV Motor M2 or Distribution Board DB2, and maintain load fed from Distribution Board DB2 via Transformer TX3

For the purposes of this exercise, assume:

- That there is no Automatic Voltage Regulation (AVR), nor any Automatic Transformer Selection/Change-Over systems present.
- That TX1, TX2, TX3 and TX4 have load indicating instruments (ammeters) available to monitor 3 phase LV load.
- That Distribution Board DB1 and Distribution Board DB2 have indicating instruments to monitor 3 phase voltages phasing and phase rotation.
- That all HV circuit breakers are of a 'rack down and removable truck' type

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Question 48 – Switching Instruction:

Switching Step	Switching Instruction/Action to be taken

[illegible]

Question 48 – Switching Instruction (continued):

[illegible]

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Switching programs

Questions 47 and 48, in the space below
switching instructions may have to be
Automatic Voltage Regulation (AVR)

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Question 49: (Short Answer – 4 Marks)

With reference to the to the single line/schematic diagrams of questions 47 and 48, in the space below briefly explain what additional precautions and/or steps within the switching instructions may have to be added if the transformers (TX1, TX2, TX3 and TX4) were fitted with Automatic Voltage Regulation (AVR) systems.

[illegible]

Question 50: (Short Answer – 4 Marks)

With reference to the to the single line/schematic diagrams of questions 47 and 48, in the space below briefly explain what additional precautions and/or steps within the switching instructions may have to be added if the transformers (TX1, TX2, TX3 and TX4) were fitted with Automatic Transformer Selection or Change-Over systems.

V. switching programs

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ms of questions 47 and 48, in the Space below
within the switching instructions may have to be
e fitted with Automatic Transformer Selection or

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Question 51: (Short Answer – 4 Marks)

With reference to the to the single line/schematic diagrams of questions 47 and 48, in the Space below briefly explain what additional precautions and/or steps within the switching instructions may have to be added if the transformers (TX1, TX2, TX3 and TX4) were fitted with Automatic Transformer Selection or Change-Over systems.



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Question 52: (Short Answer – 3 Marks)

In the space below list three (3) communications mechanisms that are commonly used to centrally coordinate HV switching programs designed to electrically isolate HV equipment within an electrical network.

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Question 53: (Complete the table – 12 Marks)

In the table below, identify the preferred sequence of implementing the switching program elements to support effective coordination of a HV switching program.

Switching Program Element	Step Sequence
Implement switching program	
Nominate switching coordinator	
Liaise with switching operators, gain confirmation of completion of each switching step.	
Coordinator - Review switching program against single line diagrams/schematics	
Coordinator - Establish current operational status of equipment and compare to single line diagrams/schematics and operational status reflected within switching program	
Coordinator - Identify/select communication mediums to be used to coordinate switching program	
Coordinator – Set go/no go timings for implementation of switching program	
Coordinator – Test communication mediums/channels	
Nominate individuals (switching operators) to be involved within switching program	
Record timings of completion of each relevant switching step upon switching program master document	
Coordinator – Brief switching operators on switching program and go/no go timings	
Liaise with switching operators, provide instruction and authorisation to perform the relevant switching step.	
Upon completion of switching, record issue of Access Permits/Permits to work upon switching program master document	

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Question 54: (Short Answer – 6 Marks)

In the spaces provided below write down seven (7) general steps used for isolation of HV equipment within a RING MAIN HV network:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____
