



Student Name:

Class:

Date:.....

2022 Certificate III Electrotechnology

UEENEEE107A Use Drawings, diagrams, Schedules, Standards, Codes & Manuals

Theory Assessment 1

Time allowed – 1 hour and 30 minutes: 6 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
A	12	
B	20	
C	20	
Total	52	

Aids to be supplied by College: Nil

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

- Electronic devices are to be turned off and removed from your person
- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- All questions are to be answered in the space provided in this question booklet. Answers to Section A (multi-choice questions) are to be recorded on the answer sheet attached to this booklet
- You are not to use any reference book in this examination
- The whole of this question booklet is to be handed to the supervisor upon completion.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Verified by: Name: Signed:Date:

Section A (12 marks)

Instructions: Select the best answer for the following statements and mark the corresponding box in the answer sheet provided. Each correct answer is worth one mark.

Question 1:

What is the purpose of an isolation switch in a circuit?

- A) To provide protection to the item of equipment
- B) To have a means of stopping a piece of equipment
- C) A switch at the supply and one at the load must be used together simultaneously
- D) To isolate the piece of electrical equipment.

Question 2:

A parallel circuit is one that:

- A) Is in series with the equipment
- B) Is split into two or more circuits that run beside each other and join again
- C) Is equipment wired one after the other in a straight line
- D) Fans out from a central point.

Question 3:

What are the main uses of a wiring diagram:

- A) To assist the electrician sell a piece of equipment
- B) To show how a piece of equipment has been wired
- C) To help with motor starting
- D) To help an electrician read how the item of equipment operates.

Question 4:

When are circuit diagrams used:

- A) During the installation of equipment
- B) When there is a fault on a certain piece of equipment
- C) To help map out an installation
- D) To assemble equipment.

Question 5:

Name the plan that aims to indicate the geographical place of a site that is of interest:

- A) Location plan
- B) Site plan**
- C) Lot plan
- D) Setting-out plan.

Question 6:

What type of plan uses bearings as described by degrees, minutes and seconds?

- A) Aerial plan**
- B) Lot plan
- C) Contour plan
- D) Location plan.

Question 7:

Describe the term “footings”:

- A) A single brick row with mortar joints
- B) A set of profiles to provide a means of accurately aligning, squaring and levelling the position of a building on site
- C) A placing of the feet
- D) They spread out the load from the building structure above to create a level stable surface to build a structure upon.**

Question 8:

A master “on” switch is connected across a two-way switch :

- A) Common and terminal one (1)
- B) The straps
- C) Common and loop**
- D) Loop and a strap.

Question 9:

What diagram shows by means of single lines and circuit symbols the flow of electric power or the sequence of operation of the circuit?

- A) circuit**
- B) single line
- C) wiring
- D) block.

Question 10:

What type of electrical diagram uses a topographical layout:

- A) **block diagram**
- B) circuit diagram
- C) installation diagram
- D) line diagram.

Question 11:

Which plan enables the electrical installer to coordinate with other selected project services for location and trenching for these services?

- A) **Architectural working drawings**
- B) Service point plan
- C) Site plan
- D) Setting out plan.

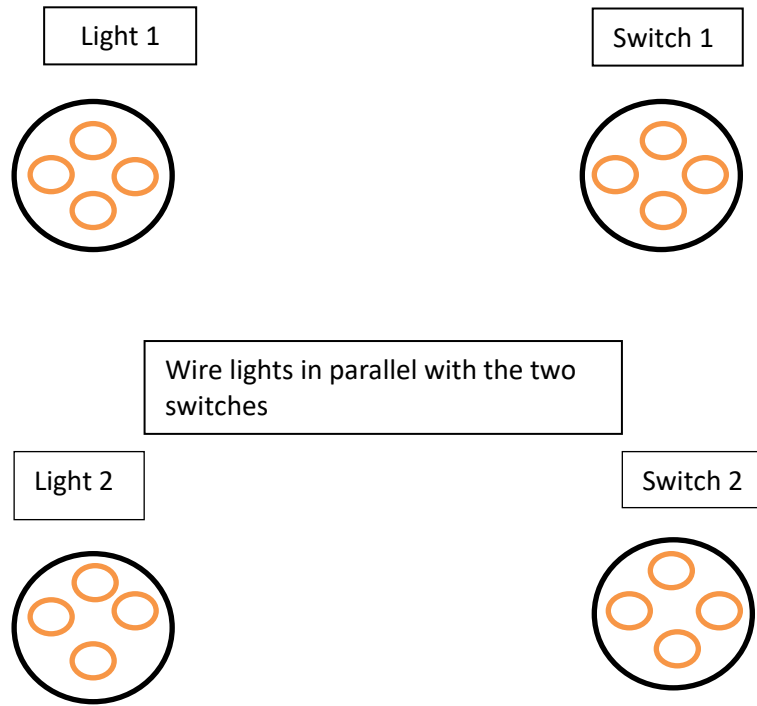
Question 12:

With what type of building construction does the electrician have to work closely with the bricklayer so that wall boxes used for switches and socket outlets are placed in the correct locations?

- A) Cavity brick
- B) **Brick veneer**
- C) Timber frame with external linings
- D) Concrete panel walls.

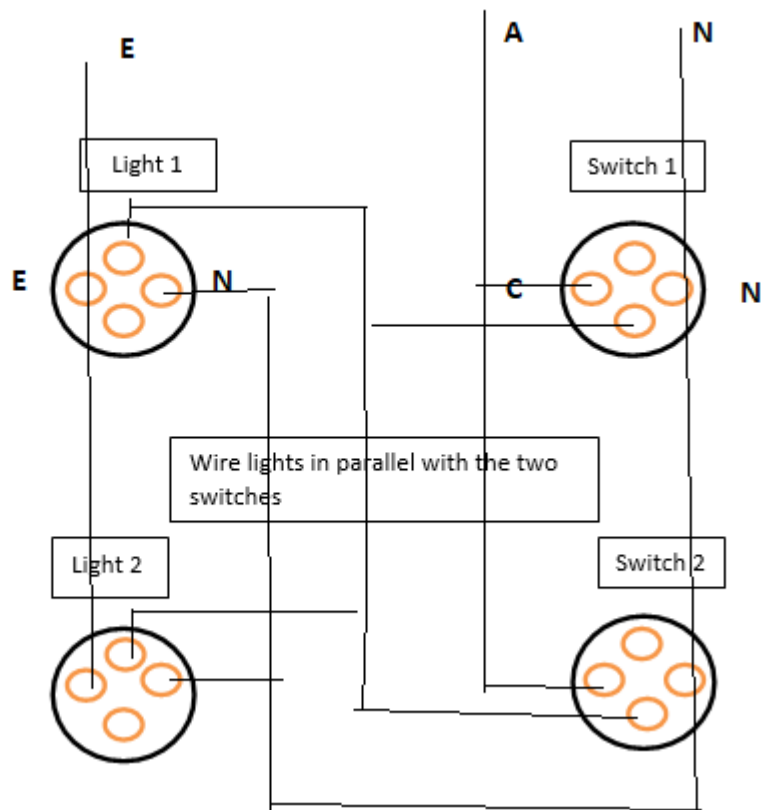
Section B: Diagrams (20 Marks)

Question 1

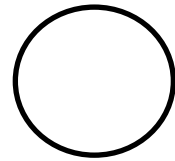
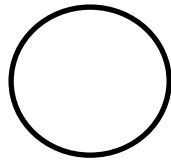
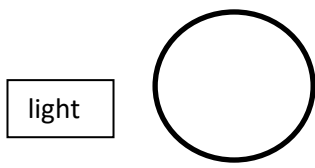


Wire lights in parallel with the two switches

Question 1

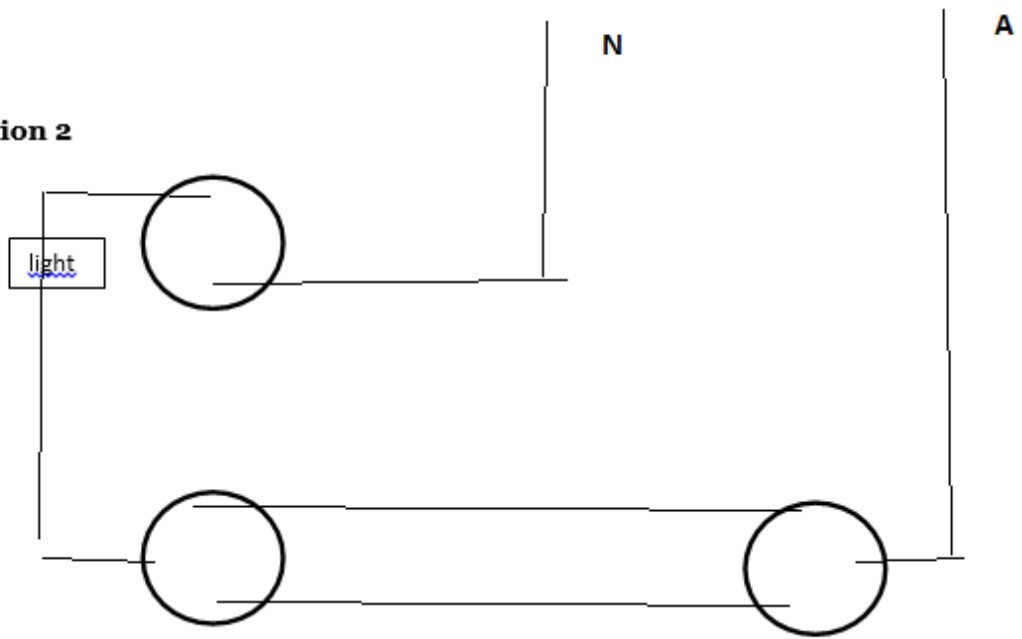


Question 2



Wire the light with the switches in two way switching

Question 2

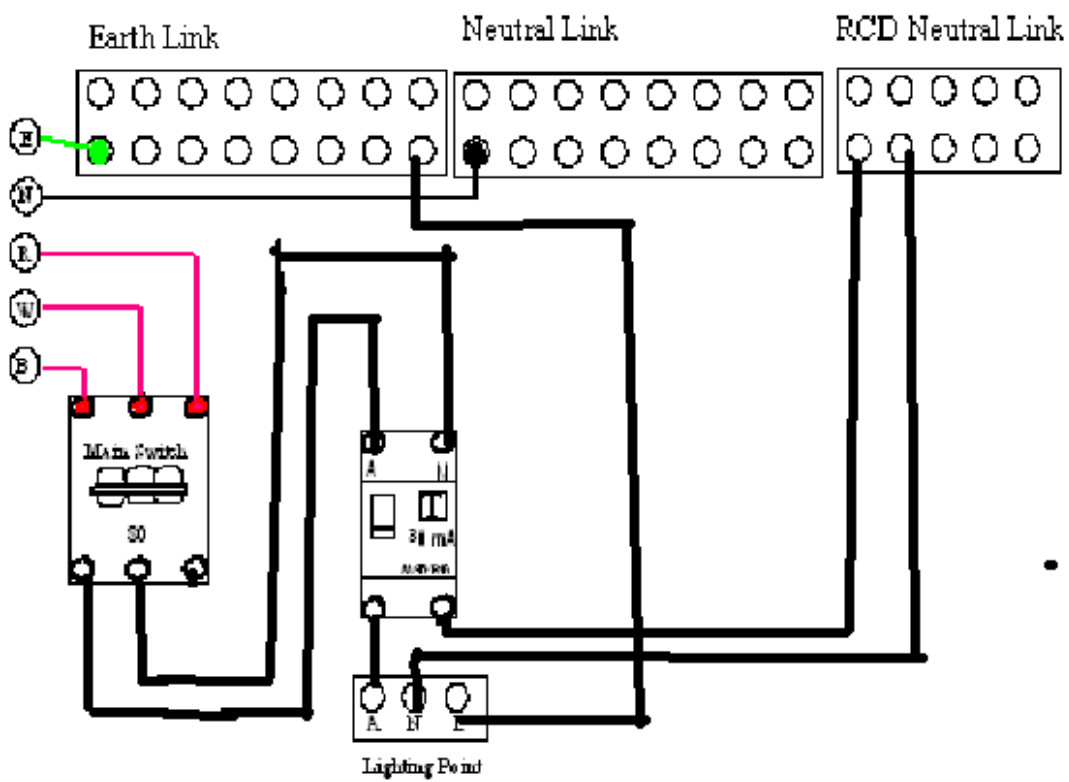


Wire the light with the switches in two way switching

Section D. (20 marks)

In the space below, using a neat freehand sketch, draw the power and control circuit to satisfy the following operational criteria.

- Earth Link, Neutral Link, RCD Neutral Link
- RCD
- Main switch
- Have all feeds terminate into a switchboard
- Lighting outlet





Student Name:

Class:

Date:.....

UEENEEE107A Use diagrams , drawings, schedules, codes

Practical Assessment 1A

Time allowed – 1 hour and 30 minutes

3 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
Total	30	

Aids to be supplied by College: Those as listed on page 2 of this document

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

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- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- You will be required to connect and operate an electrical control circuit
- The teacher will need to check your progress at various stages during this assessment.
You must not proceed until the teacher has signed off
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Verified by: Name: Signed:Date:

S1/ S2- Magnetic Circuit Breakers Normally Open

S1+S2 close----S3 or S4 closes----Control relay CR1 is energised. Lamp L1 indicates it. Then the contact CR1-1 is closed by Control Relay CR1

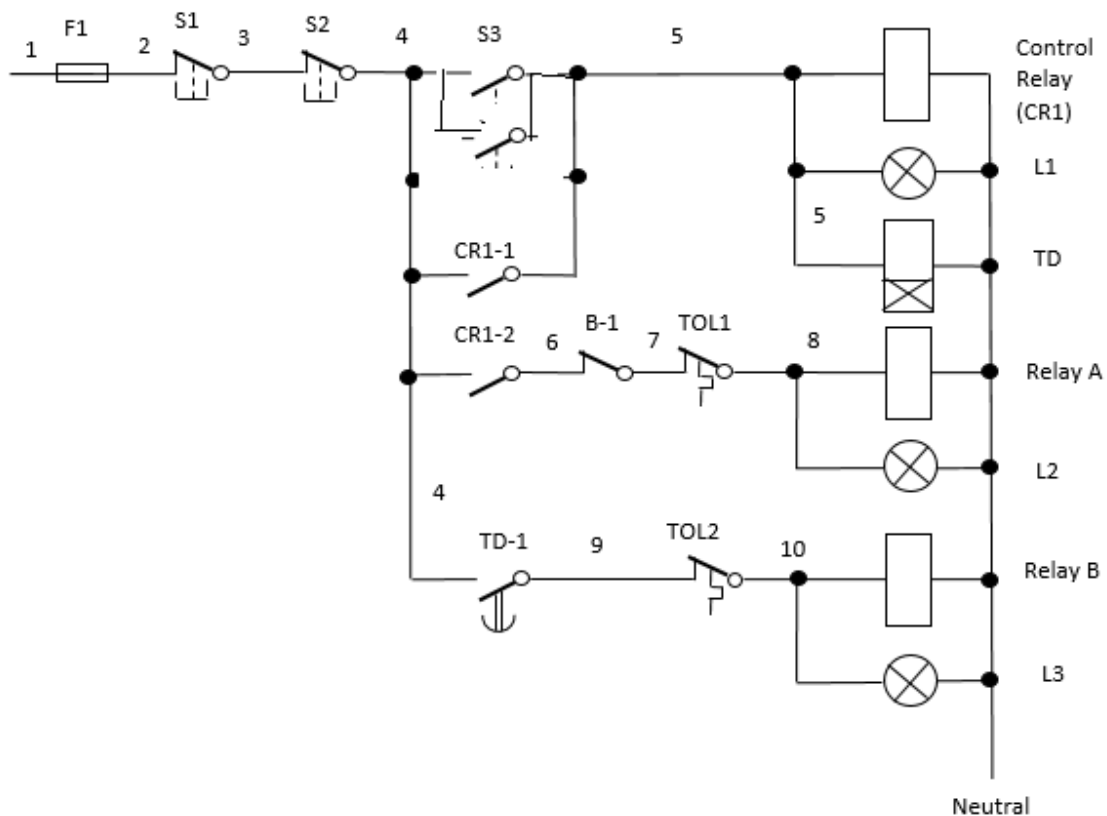
In the mean time, the contact CR1-2 is closed by Control Relay CR1
Relay A is energized. It is indicated by lamp.

In the mean time, Time delay coil TD is also energized

Time delay coil TD closes the Time delay contact TD1
Closure of TD1 energizes Relay B. It is indicated by lamp.

B1 is normally close contact. TOL1 and TOL2 are thermal overloads which can cut off the current flow to Relay A and B

2. Add a double pole Jog button to the circuit of the control relay and test the circuit.



Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

3. What is the purpose of the contact CR1.1 connected in parallel with S4? (2 marks)

It is alternative contact for S4 . It is closed by Control Relay so that S4 will not need to be pressed for all time.

4. What type of timer is shown in the circuit? (1 mark)

Magnetic

5. Explain the purpose of the N/C contact “B-1” in the circuit (2 marks)

To switch off the current to Relay A

6. If the timer fails to energise what will be the effect on the circuit (2 marks)

Relay B will not be energized.

7. What do pushbuttons S1, S2, S3 & S4 form? (1 mark)

S1,S2—Normally close S3/S4 Normally open

8. When the timer is de-energised after having been energised, explain how the timer contact will react. (2 marks)

TD1 will wait a pre-set time and then it will open

**2022 Certificate III Electrotechnology
Electrical Control Circuit
G109a
Practical 1A**

**Time allowed – 1 hour and 30 minutes
3 Pages in this Question Booklet**

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
TOTAL	30	

Instructions to Students:

- You may use your TAFE workbook in this assessment for reference to programming details.
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. **No connection or disconnection is to be carried out on a live circuit.**

Aids permitted where indicated:

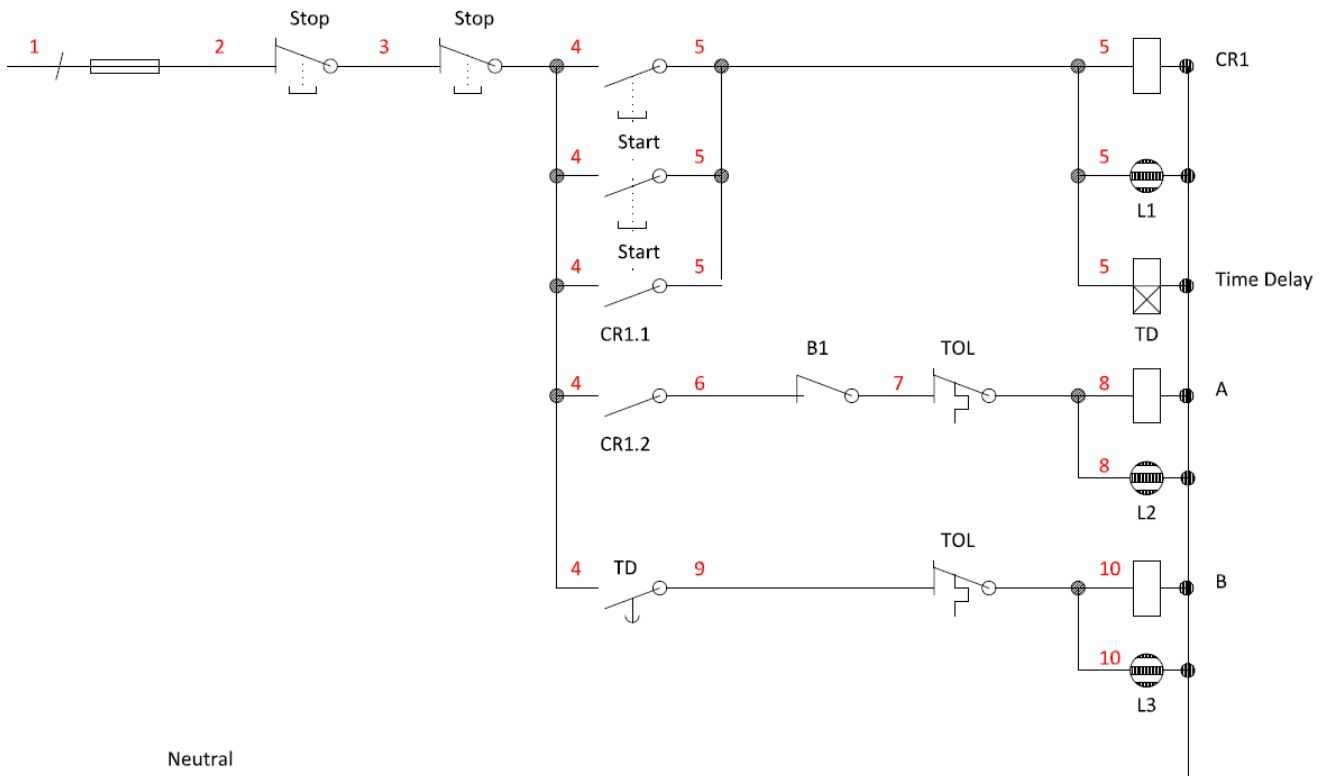
Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

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Question 1

Equipment:

- 2 x N/O pushbuttons
- 2 x N/C pushbuttons
- 2 x Thermal overload units
- 1 x 24 volt plug in relay and panel
- 2 x 24 volt contactors with 4 N/O contacts
- 1 auxiliary contact block with at least 1 N/C contact
- 1 x 24 volt 'On delay' Timer
- 1 x fuse panel
- 1 x LED panel



Attempt 1	Attempt 2	Teacher Assist
10 Marks	5 Marks	0 Marks

2. Add a double pole Jog button to the circuit of the control relay and test the circuit.

Note: Do not connect the supply until the teacher has checked your circuit.

Attempt 1	Attempt 2	Teacher Assist
10 Marks	5 Marks	0 Marks

3. What is the purpose of the contact CR1.1 connected in parallel with S2? **(2 Marks)**

4. What type of timer is shown in the circuit? **(1 Mark)**

5. Explain the purpose of the N/C contact 'B' in the circuit. **(2 Marks)**

6. If the timer fails to energise what will be the effect on the circuit. **(2 Marks)**

7. What do pushbuttons S1, S2, S3, & S4 form? **(1 Mark)**

8. When the timer is de-energised after having been energised explain how the contact will react. **(2 Marks)**



Student Name:

Class:

Date:.....

UEENEEG109A Develop and Connect Electrical Control Circuits

Practical Assessment 1A

Time allowed – 1 hour and 30 minutes

3 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
Total	30	

Aids to be supplied by College: Those as listed on page 2 of this document

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

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- You cannot access an electronic device during this examination
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- You will be required to connect and operate an electrical control circuit
- The teacher will need to check your progress at various stages during this assessment.
- ***You must not proceed until the teacher has signed off***
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Verified by: Name: E (Jim) Ferguson Signed: JF Date: 26/018/2013 .

2. Add a double pole Jog button to the circuit of the control relay and test the circuit.

Note: Do not connect the supply until the teacher has checked your circuit

Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

3. What is the purpose of the contact CR1.1 connected in parallel with S4? (2 marks)

4. What type of timer is shown in the circuit? (1 mark)

5. Explain the purpose of the N/C contact “B-1” in the circuit (2 marks)

6. If the timer fails to energise what will be the effect on the circuit (2 marks)

7. What do pushbuttons S1, S2, S3 & S4 form? (1 mark)

8. When the timer is de-energised after having been energised, explain how the timer contact will react. (2 marks)

Student Name: _____

Class: _____

Date: _____

2022 Certificate III Electrotechnology
Electrical Control Circuit
G109a
Practical 2A
Time allowed – 1 hour and 30 minutes
3 Pages in this Question Booklet

Student Feedback/Comments

<p>The results of my performance have been discussed and explained to me.</p>			
Student:		Date:	
<p>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.</p>			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

	Possible Marks	Actual Marks
Q1	20	
Q2	10	
TOTAL	30	

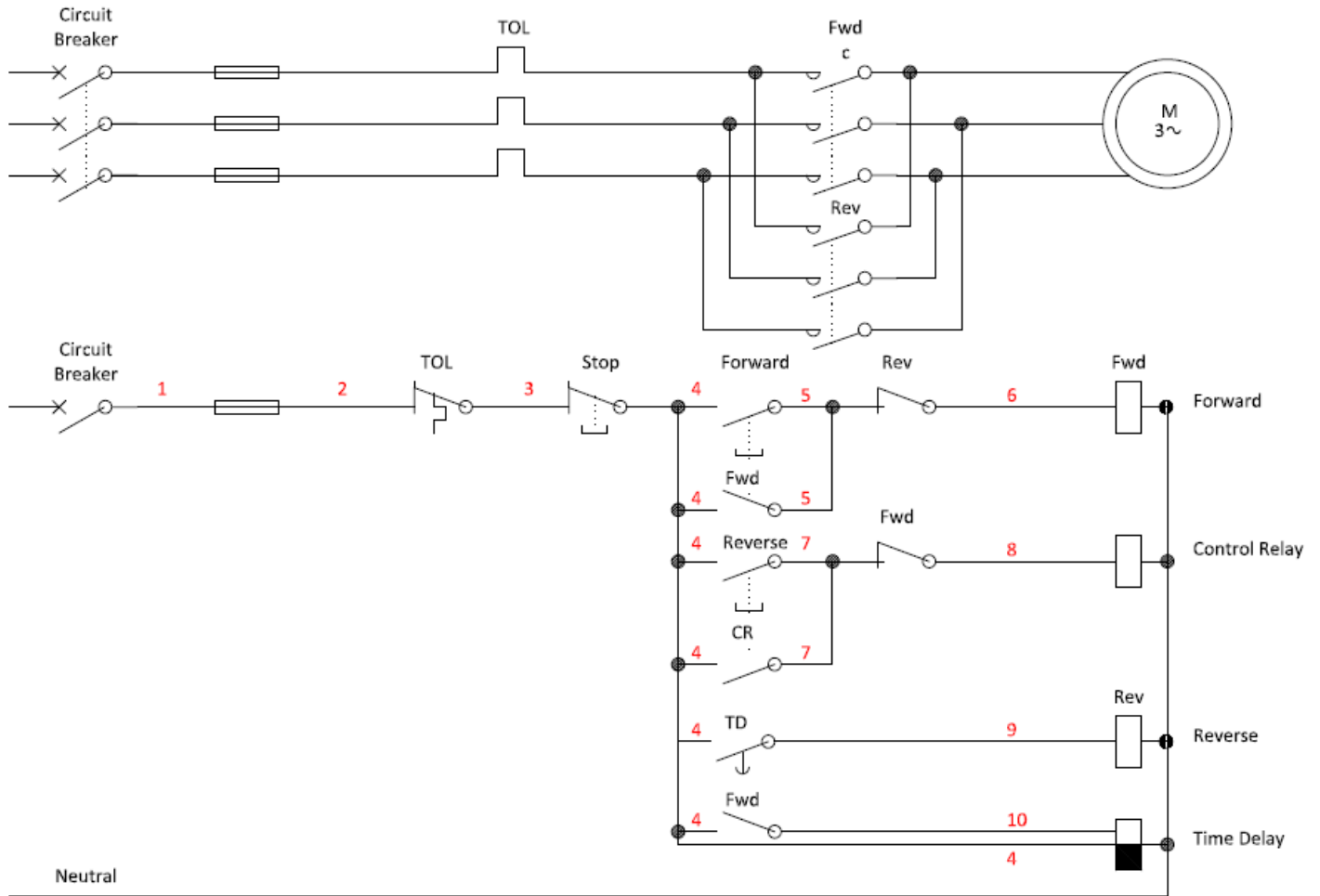
Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Equipment:

- 2 x N/O pushbuttons
- 2 x N/C pushbuttons
- 1 x Thermal overload unit
- 1 x panel with 2 mechanically interlocked contactors
- 2 auxiliary contact blocks with at least 1 N/C contact
- 1 x fuse panel
- 1 x Delay of timer
- 1 x 3 Phase 41.5 volt induction motor

1. Connect the components listed under equipment to form the circuit shown below and test the operation of the circuit.

Note: Do not energise the circuit until the teacher has checked your circuit.



Attempt 1	Attempt 2	Teacher Assist
20 Marks	15 Marks	0 Marks

2. Add a selector switch to to enable Jogging in forward direction only.

Note: Do not energise the circuit until the teacher has checked your circuit.

Attempt 1	Attempt 2	Teacher Assist
10 Marks	5 Marks	0 Marks

Student Name: _____

Class: _____

Date: _____

**2022 Certificate III Electrotechnology
Electrical Control Circuit
G109a
Practical 3A
Time allowed – 1 hour and 30 minutes
2 Pages in this Question Booklet**

Student Feedback/Comments

<p>The results of my performance have been discussed and explained to me.</p>			
Student:		Date:	
<p>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.</p>			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

	Possible Marks	Actual Marks
Design	10	
Download	10	
Wire	20	
Commission	60	
TOTAL	100	

Instructions to Students:

- You may use your TAFE workbook in this assessment for reference to programming details.
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. **No connection or disconnection is to be carried out on a live circuit.**

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Question 1

Enter the following program into the Koyo PLC. After the program has been fully entered save the program to the memory ready for testing. The system is to be wired and demonstrated.

- A motor control circuit has a stop/start station.
- 10 seconds after the start button is pressed the motor will start.
- The motor is protected by a thermal overload.
- The motor has run and stop lights.
- The circuit has a counter to trace the number of motor starts and can only be reset with a maintenance switch (press button).
- The circuit has a system enable light that will come on 15 seconds after motor starts.
- The enable light is to flash 0.5 seconds on – 0.5 seconds off.
- 30 seconds after the enable light begins the system will shut down automatically.
- **The circuit is to include the motor contactor however you are not required to wire the motor.**



Student Name:

Class:

Date:.....

UEENEEG109A Develop and Connect Electrical Control Circuits

Practical Assessment 1A

Time allowed – 1 hour and 30 minutes

3 Pages in this Question Booklet

Student Feedback/Comments

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Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
Total	30	

Aids to be supplied by College: Those as listed on page 2 of this document

Aids to be supplied by student: Pen, pencil, rule and calculator

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You must not proceed until the teacher has signed off
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
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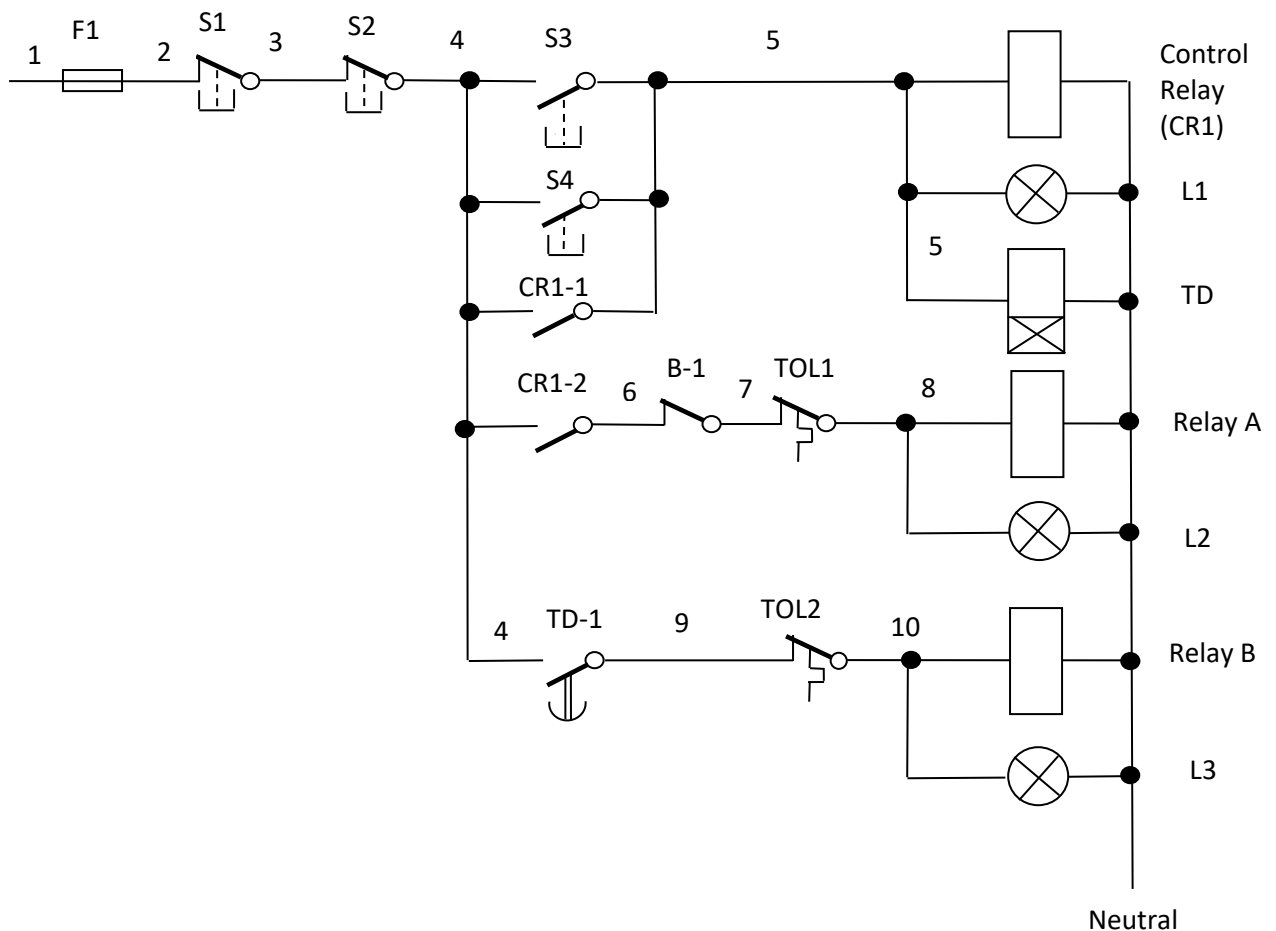
Verified by: Name: Signed:Date:

Question 1: (10 Marks)

Equipment:

- 2 x N/O pushbuttons
- 2 x N/C pushbuttons
- 2 x thermal overload units
- 1 x 24 Volt plug in relay and panel
- 2 x 24 volt contactors with 4 x N/O contacts
- 1 auxiliary contact block with at least 1 x N/C contact
- 1 x 24 volt “On Delay” timer
- 1 x fuse panel
- 1 x LED panel
- Leads

Construct the circuit and demonstrate its operation.



Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

2. Add a double pole Jog button to the circuit of the control relay and test the circuit.

Note: Do not connect the supply until the teacher has checked your circuit

Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

3. What is the purpose of the contact CR1.1 connected in parallel with S4? (2 marks)

4. What type of timer is shown in the circuit? (1 mark)

5. Explain the purpose of the N/C contact “B-1” in the circuit (2 marks)

6. If the timer fails to energise what will be the effect on the circuit (2 marks)

7. What do pushbuttons S1, S2, S3 & S4 form? (1 mark)

8. When the timer is de-energised after having been energised, explain how the timer contact will react. (2 marks)

Student Name : _____
Class : _____
Date: _____

UEE30811
Certificate III Electrotechnology

UEENEEG109A
Electrical Control Circuit

TEST 1A

Time allowed – 1 hour and 30 minutes

8 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

SECTION	Possible Marks	Actual Marks
A	10	
B	40	
C	25	
TOTAL	75	

Instructions to Students:

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- You are not to use any reference book in this examination.
- The whole of this Question Booklet is to be handed to the Supervisor upon completion.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

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Section A – (10 Marks)

Instructions: Select the best answer for the following statements and place the corresponding letter answer sheet provided. Each correct answer is worth one mark.

Question 1.

Another name for a schematic diagram :-

- (A) A wiring diagram
- (B) A block diagram
- (C) A circuit diagram
- (D) A rung diagram

Question 2.

The main purpose of a schematic diagram is to show:-

- (A) The route of the associated wiring
- (B) The equipment terminal numbers
- (C) How the equipment is to be mounted
- (D) The electrical operation of the equipment

Question 3.

In a basic stop/start relay circuit the latching contact is connected :-

- (A) In parallel with the stop button
- (B) In parallel with the start button
- (C) In series with the stop button
- (D) In series with the start button

Question 4.

When a normally open non latching pushbutton is pressed the contacts:-

- (A) Open until the button is released
- (B) Close and remain closed until the button is pressed again
- (C) Close as long as the button is pressed
- (D) Do not operate unless a retaining contact is connected in parallel

Question 5.

When an electrical relay is de-energised:

- (A) All contacts remain in the actuated state
- (B) The N/O contacts are open and the N/C contacts are closed
- (C) The coil is connected to the supply and all contacts change state
- (D) A pilot lamp supplied via a N/O contact will light

Question 6.

In a horizontally drawn circuit diagram:-

- (A) Energy flow is from top to bottom
- (B) Control devices are placed to the right of the diagram
- (C) All components and wiring are drawn horizontally
- (D) The sequence of events is from top to bottom

Question 7.

The contacts of an 'On delay' timer will:-

- (A) Open or close immediately the timer is energised
- (B) Open or close immediately the timer is de-energised
- (C) Open or close a set time after the timer is energised
- (D) Open or close a set time after the timer is de-energised

Question 8.

Jog or inch controls in a circuit allow:-

- (A) DOL operation
- (B) Limiting of starting currents
- (C) Small rotational movements of the motor
- (D) No automatic starting of the motor

Question 9.

Thermal Overload contacts will trip:-

- (A) When the power circuit draws excessive current
- (B) Inversely proportional to the current and time
- (C) Immediately the control circuit draws excessive current
- (D) After the temperature rise of the motor reaches 95°C

Question 10.

In a vertically drawn circuit diagram:-

- (A) Energy flow is from top to bottom
- (B) Control devices are placed to the right of the diagram
- (C) All components and wiring are drawn horizontally
- (D) The sequence of events is from top to bottom

Section B – (40 Marks)

Question 1.

List the specifications that must be considered to correctly select a relay for use in an electrical control circuit. *(4 marks)*

Question 2.

Certain conventions are followed when drawing electrical circuit diagrams. List the conventions followed when drawing a vertically oriented circuit diagram. *(4 marks)*

Question 3.

Explain the difference in operation between a manual switch and a pushbutton. *(3 marks)*

Question 4.

Briefly explain the difference between using detached symbols and semi-detached symbols in a circuit diagram. *(4 marks)*

Question 5.

Name four types of motor protection. *(4 marks)*

Question 6.

List the specifications that must be considered to correctly select a timer for use in an electrical control circuit.

Question 7.

Explain the meaning of the term 'Jog' or 'Inch' as applied to an electric motor. *(4 marks)*

Question 10.

Answer the following questions in regard to the operation of the control circuit shown in Figure 1. **(5 Marks)**

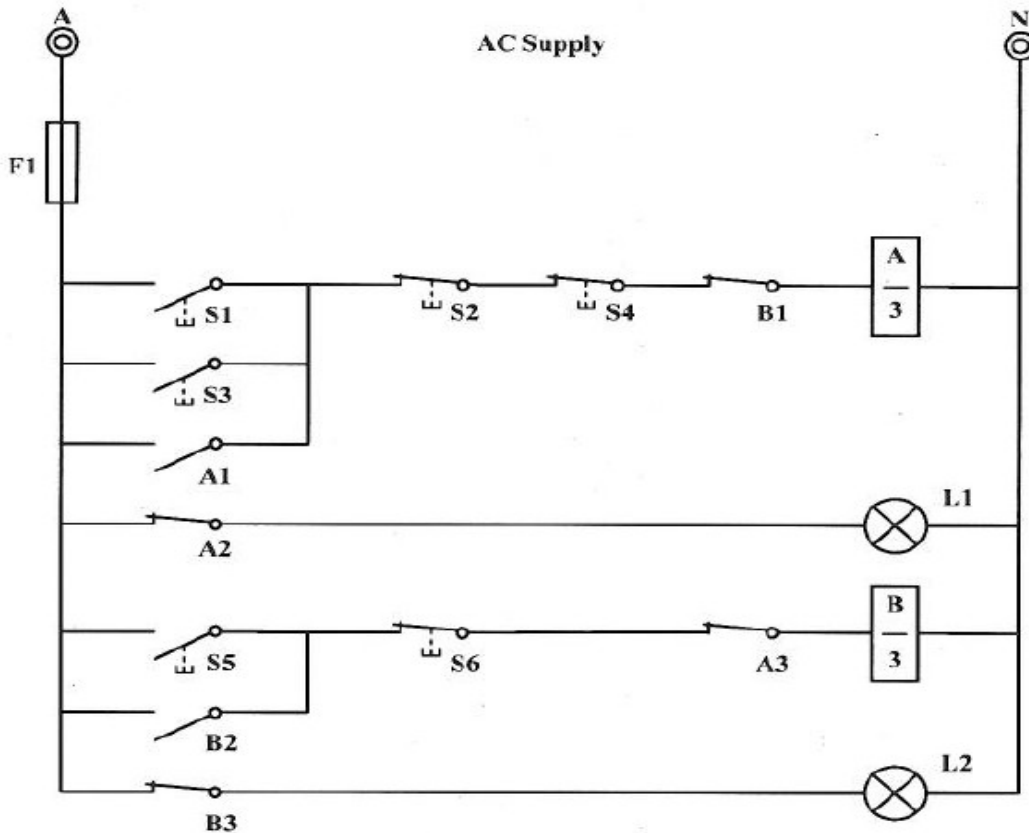


Figure 1

(a) Before any pushbutton is pressed what is the condition of Relay "B" and indicating lamp L1?

(b) If pushbutton S5 is pressed after relay 'A' is energised what will the effect be on contact A3, Relay 'B' and indicating lamp L3?

(c) The two contacts B1 and A3 provide

Student Name : _____

Class : _____

Date: _____

**2022 Certificate III Electrotechnology
Electrical Control Circuit
G109a
TEST 2A**

**Time allowed – 1 hour and 30 minutes
9 Pages in this Question Booklet**

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

SECTION	Possible Marks	Actual Marks
A	15	
B	40	
C	20	
TOTAL	75	

Instructions to Students:

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Aids permitted where indicated:

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Section A – (15 Marks)

Instructions: Select the best answer for the following statements and place the corresponding letter in the answer sheet provided. Each correct answer is worth one mark.

Question 1.

The star and delta contactors in an automatic star-delta starter should be mechanically interlocked to prevent:-

- (A) Over speeding the motor
- (B) Motor starting
- (C) Short circuiting the supply
- (D) Over current

Question 2.

The relationship between the operating time and current of a thermal overload is known as the:-

- (A) time to current ration
- (B) inverse time characteristic
- (C) proportional time characteristic
- (D) trip time characteristic

Question 3.

The starting torque of a three phase induction motor varies:-

- (A) Directly with the applied voltage
- (B) Inversely with the applied voltage
- (C) Inversely with the speed of the motor
- (D) directly with the applied voltage squared

Question 4.

A three phase primary resistance starter connects the resistors:-

- (A) In series with the stator windings
- (B) In parallel with the stator windings
- (C) In series with the rotor
- (D) In parallel with the rotor

Question 5.

Thermistors located within the motor winding as a further protection against overload have a:-

- (A) zero temperature coefficient
- (B) negative temperature coefficient
- (C) positive temperature coefficient
- (D) variable temperature coefficient

Question 6.

During the acceleration of a squirrel cage induction motor the resistance of a primary resistance starter is:-

- (A) Gradually increased
- (B) Gradually decreased
- (C) Left unchanged
- (D) Alternately disconnected and reconnected to the motor

Question 7.

To reverse the direction of rotation of the three phase squirrel cage induction motor you would:-

- (A) Disconnect and reverse the slip ring connections
- (B) Change the delta connected stator to star connected
- (C) Replace the squirrel cage rotor with a slip ring rotor
- (D) Interchange any two of the supply lines

Question 8.

The thermal overload contact in a control circuit is:-

- (A) Normally closed
- (B) Normally open
- (C) Spring loaded normally open
- (D) Spring loaded normally closed

Question 9.

Thermal Overload contacts will trip:-

- (A) When the power circuit draws excessive current
- (B) Inversely proportional to the current and time
- (C) Immediately the control circuit draws excessive current
- (D) After the temperature rise of the motor reaches 95⁰C

Question 10.

The effect of reducing the applied voltage to a motor will be to:-

- (A) Reduce starting current while increasing starting torque
- (B) Reduce starting current and starting torque
- (C) Increase the starting current while reducing starting torque
- (D) Increase starting current and starting torque

Question 11.

When using a star-delta starter the voltage applied to each phase of a three phase motor during the starting phase will be:-

- (A) 3 times the line voltage
- (B) equal to the line voltage
- (C) 1/3 times the line voltage
- (D) $1/\sqrt{3}$ times the line voltage

Question 12.

A star delta starter is used to start a three phase squirrel cage induction motor, after 10 minutes the motor is running hot and slow, the most likely fault is:-

- (A) Low insulation resistance
- (B) Open circuit coil
- (C) Faulty timer
- (D) Broken earth wire

Question 13.

For star-delta starting the number of terminals required at the induction motor terminal block is:-

- (A) 2
- (B) 3
- (C) 4
- (D) 6

Question 14.

When using a secondary resistance starter with a three phase induction motor the starting resistors are:

- (A) connected in series with the stator windings
- (B) connected in parallel with the stator windings
- (C) connected in series with the rotor winding
- (D) connected in parallel with the rotor windings

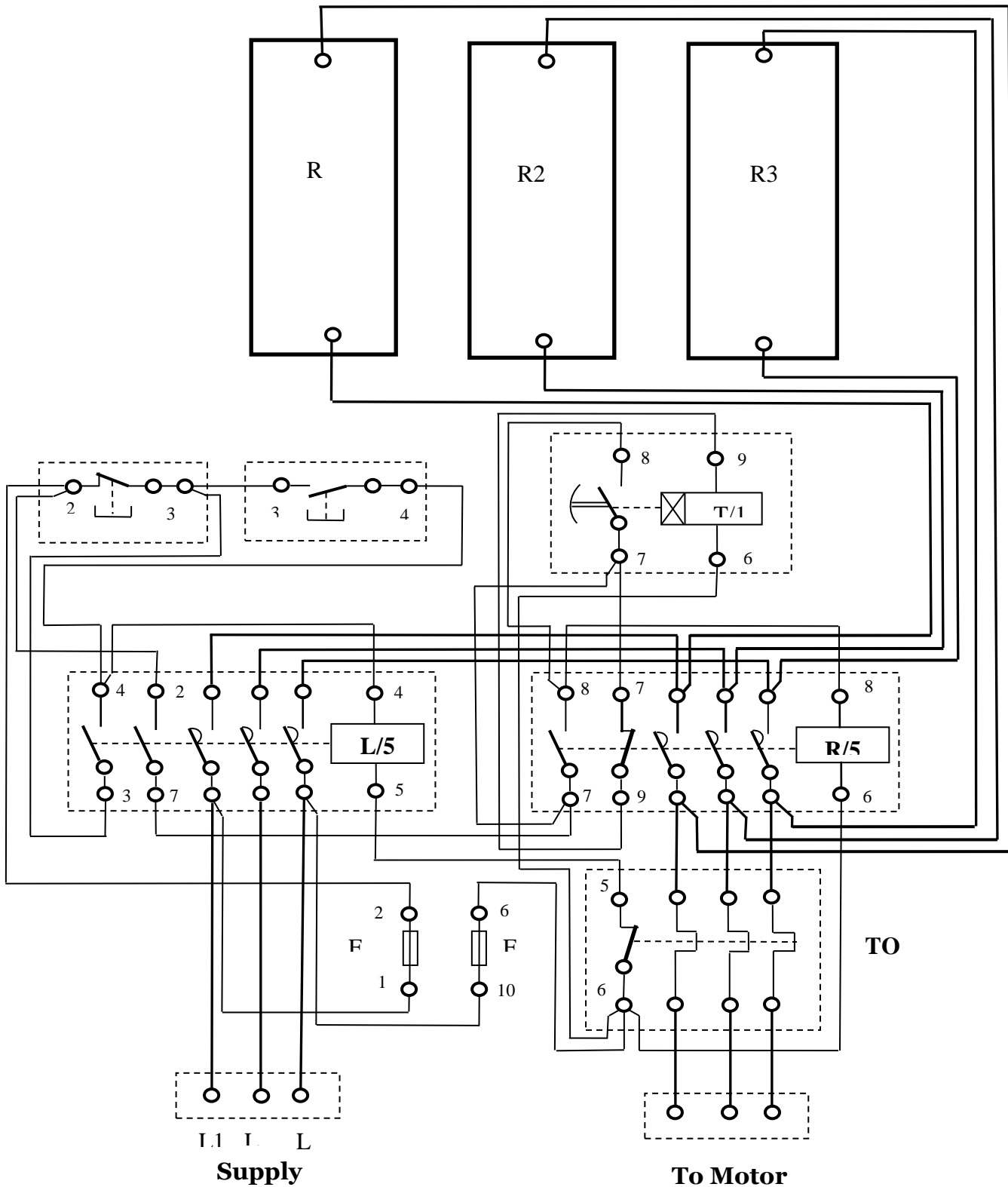
Question 15.

An auto transformer starter is used to start a three phase squirrel cage induction motor. If the torque of the motor when started DOL is 54 Nm the torque of the motor at start when using the 60% tapping of the auto transformer will be:

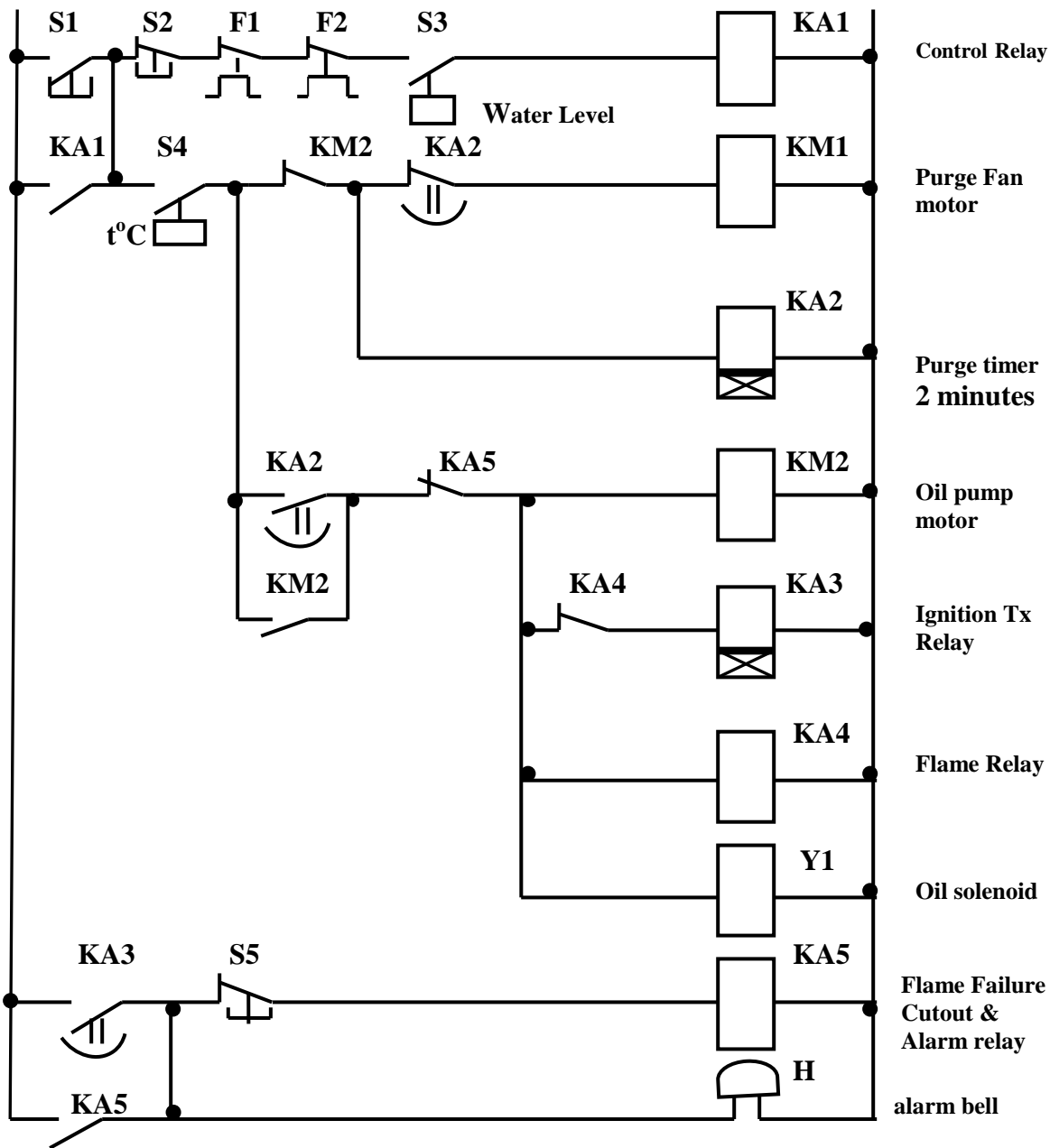
- (A) 60% of the DOL value
- (B) equal to the DOL value
- (C) 36% of the DOL Value
- (D) 57% of the DOL value

Section B – (40 Marks)

Question 1. Convert the Wiring diagram of figure 1 below to a circuit diagram. Include the power and control circuits, line and wire numbering, and all labelling. *(24 Marks)*



Question 3. Answer the following questions in regard to the operation of the control circuit shown in Figure 2 below.



Assuming all conditions have been met to allow the circuit to operate answer the following questions

(a) What is the function of the switch marked 'S3'? (3 marks)

(b) If the contacts marked 'KA2' operate what effect will there be on the circuit?
(3 Marks)

(c) Explain the effect of closing contact 'KA3'. (3 Marks)

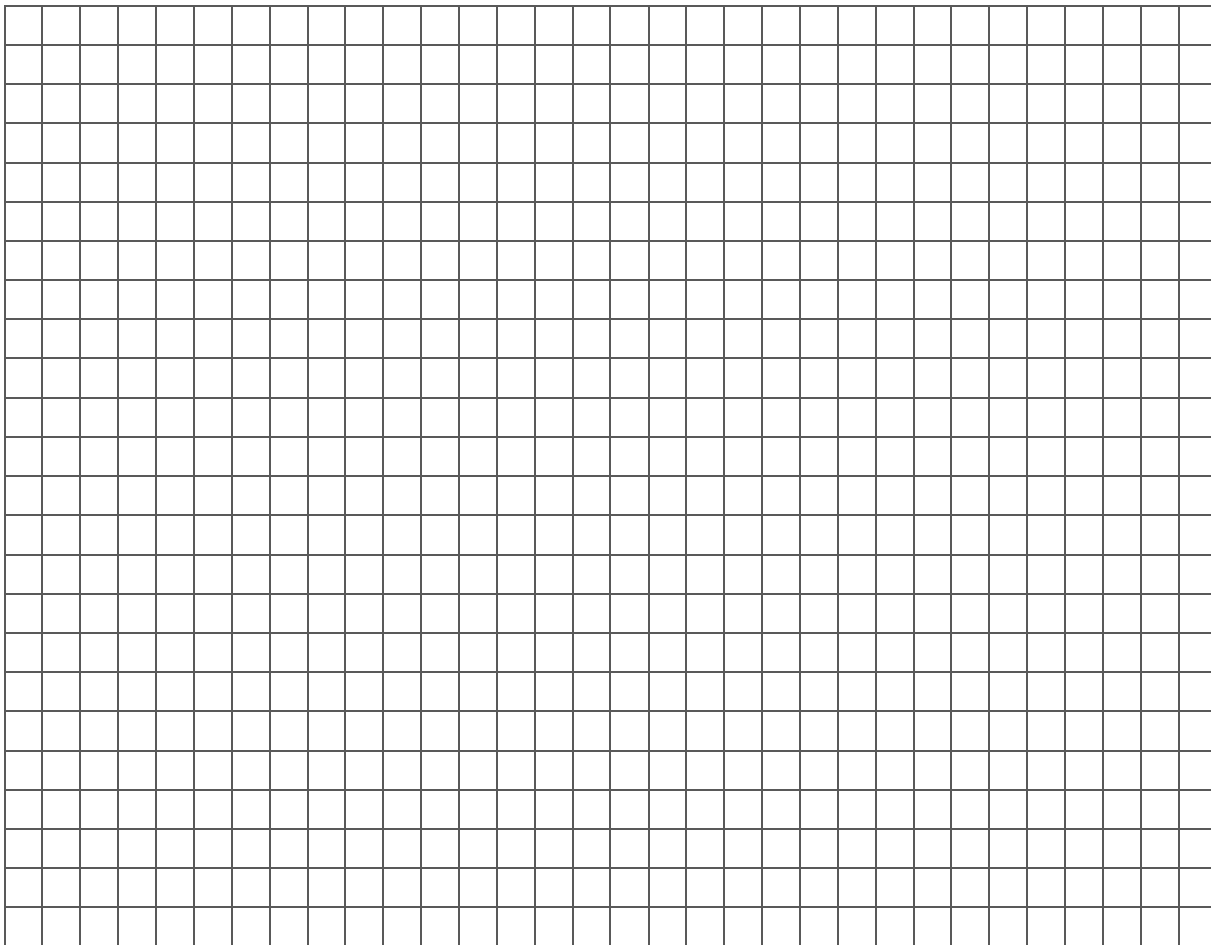
(d) Explain the purpose of the N/C contact 'KA4'. (3 Marks)

(c) The circuit shown in figure 2 involves sequencing. Describe how sequencing is achieved in this circuit.
(4 Marks)

Section C – (20 Marks)

On the grid paper provided, using a neat freehand sketch, draw the power and control circuit to satisfy the following operational criteria.

- A three phase delta connected squirrel cage induction motor is connected to run in forward or reverse direction. Three push buttons are used to provide control for the motor. S1 – forward, S2 – reverse and S3 is the only stop button. The motor is protected by a thermal overload.
- When power is first applied and before any pushbutton is pressed all relays will be de-energised.
- Pressing pushbutton S1 will cause the motor to start and run in the forward direction.
- When the stop button is pressed there must be a 15 second delay before the motor can be restarted in reverse by pressing button S2.
- Number each wire and line in the circuit diagram
- Label all relays, contactors, timers, contacts, and pushbuttons.



Student Name : _____

Class : _____

Date: _____

**2022 Certificate III Electrotechnology
Electrical Control Circuit
G109a
TEST 3A**

**Time allowed – 1 hour and 30 minutes
13 Pages in this Question Booklet**

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

SECTION	Possible Marks	Actual Marks
A	20	
B	40	
C	40	
TOTAL	100	

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Section A – (20 Marks)

Instructions: Select the best answer for the following statements and place the corresponding letter in the space provided on the answer sheet. Each correct answer is worth one mark.

Question 1

Modern programmable controllers are usually programmed using:

- A. Boolean Algebra
- B. Fortran
- C. Basic
- D. Ladder Logic

Question 2

Failsafe braking of an electric motor is where:-

- (A) an operator is present at all times during operation of the motor
- (B) an automatic electro-mechanical brake is used stop and/or hold the motor
- (C) two switches must be pressed simultaneously
- (D) is another name for Dynamic braking

Question 3

Timers may be cascaded to:

- A. Increase the total preset time
- B. Increase the number of contacts
- C. Allow timing functions to be manually set
- D. Decrease the number of programming instructions required

Question 4

An advantage of a programmable controller over a conventional relay circuit is:

- A. The contacts can carry more current
- B. Controllers have a greater tolerance for mechanical vibration
- C. The circuit operation can be more readily altered
- D. The controller can operate at higher voltage levels

Question 5

Soft starters limit the starting current of a motor by:-

- (A) controlling the triggering angle of SCRs
- (B) placing liquid resistors in series with the stator
- (C) placing reactors in series with the stator
- (D) controlling the frequency of the supply

Question 6

The preferred starter for a 300kW motor is:

- A. Half wave controller
- B. Full wave controller
- C. Cant not be used on a 300kW motor
- D. None of the above

Question 7

A counter in a programmable controller will register a count when:

- E. The reset contact is open and the input is closed
- F. The reset contact is closed and the input is closed
- G. The reset contact is open and the input is open
- H. The reset contact is closed and the input disconnected

Question 8

The primary reason for using reduced voltage starting is used:

- A. It is a matter of regulation
- B. Electricians provide them as service to customers.
- C. They are the least expensive form of starter.
- D. Electricians are always conscience of the green foot print.

Question 9

A timer that retains the accumulated time when power is lost is known as a:

- E. Memory timer
- F. Residual timer
- G. Retentive timer
- H. Locked timer

Question 10

The type of thermistor used with AC motors:

- (A) has a negative temperature coefficient of resistance
- (B) has a positive temperature coefficient of resistance
- (C) has a zero temperature coefficient of resistance
- (D) is bimetallic

Question 11

Which of the following are all input devices?

- A. Led, pushbutton, coil
- B. Coil, float switch, pushbutton
- C. Contactor, motor, led
- D. Float switch, limit switch, proximity switch

Question 12

When used with a programmable controller stop buttons should be:

- A. Wired normally closed and programmed normally open
- B. Wired normally open and programmed normally open
- C. Wired normally closed and programmed normally closed
- D. Wired normally open and programmed normally closed

Question 13

A consequent pole mote has

- A. Two speeds
- B. Four speeds
- C. Variable speed (0-100%)
- D. 2 poles

Question 14

Inputs in a PLC programme can be:

- A. Used once
- B. Used twice
- C. Used as many times as needed
- D. None of the above

Question 15

A variable speed drive can achieved a starting of

- A. 200% - FLA
- B. 300% - FLA
- C. 110% - FLA
- D. 80% - FLA

Question 16

Outputs in a PLC programme can be:

- A. Used once
- B. Used twice
- C. Used as many times as needed
- D. None of the above.

Question 17

Transducers are:

- A. Specifically Digital outputs
- B. Specifically Analogue outputs
- C. Specially Analogue inputs
- D. Analogue or Digital inputs

Question 18

Conventional relays are used:

- A. In control circuits
- B. In power circuits.
- C. Only on 24 volt circuits
- D. None of the above.

Question 19

Star delta starters will have

- A. 2 wires at the motor terminals
- B. 4 wires at the motor terminals
- C. 6 wires at the motor terminals
- D. 8 wires at the motor terminals.

Question 20

Thermistors used in motor protection are generally

- A. PTC
- B. NTC
- C. Manual reset.
- D. None of the above.

Section B – 40 Marks

Question 1 (3 Marks)

Name three types of variable speed drives

- a.
- b.
- c.

Question 2 (4 Marks)

List 4 advantages of a PLC

- a.
- b.
- c.
- d.

Question 3 (3 Marks)

Name three types of motor protection

- a.
- b.
- c.

Question 4 (4 Marks)

List 4 advantages of a variable speed drive over a DOL starter

- a.
- b.
- c.
- d.

Question 5 (2 Marks)

Explain the function of an interlock

- a.
.....

Question 6 (2 Marks)

What type of motor is used for a primary resistance starter

- a.
.....

Question 7 (3 Marks)

Nominate 3 coil voltages for that can be used for relays.

- a.....
- b.....
- c.....

Question 8 (2 Marks)

What the basic difference between a relay and a contactor.

- a.
.....

Question 9 (3 Marks)

Nominate 3 types of braking on induction motors.

- a.....
- b.....
- c.....

Question 10 (4 Marks)

Name two types of drawing configuration used in the electrical industry

- a.
- b.

Question 11 (2 Marks)

What type of motor is used for a secondary resistance starter

- a.
.....

Question 12 (2 Marks)

What is the estimated starting current of a motor started DOL

- a.
.....

Question 13 (4 Marks)

Briefly explain the inverse time characteristic of a thermal overload.

- a.
.....

Question 14 (2 Marks)

Nominate two functions of electronic time delays.

- a.
- b.

Section C – 40 Marks

Question 1

Draw a block diagram of a programmable controller. Label each component and show how each is interconnected. Using arrows indicate how the data flows between each component.

(5 Marks)

Question 2

Using the information given below develop a suitable ladder diagram for entry into a programmable controller and write the program to be entered.

When X3 turns on and output Y5 turns on 11 seconds later. Y5 will turn on after 11 seconds irrespective of how long X3 is on.

(10 marks)

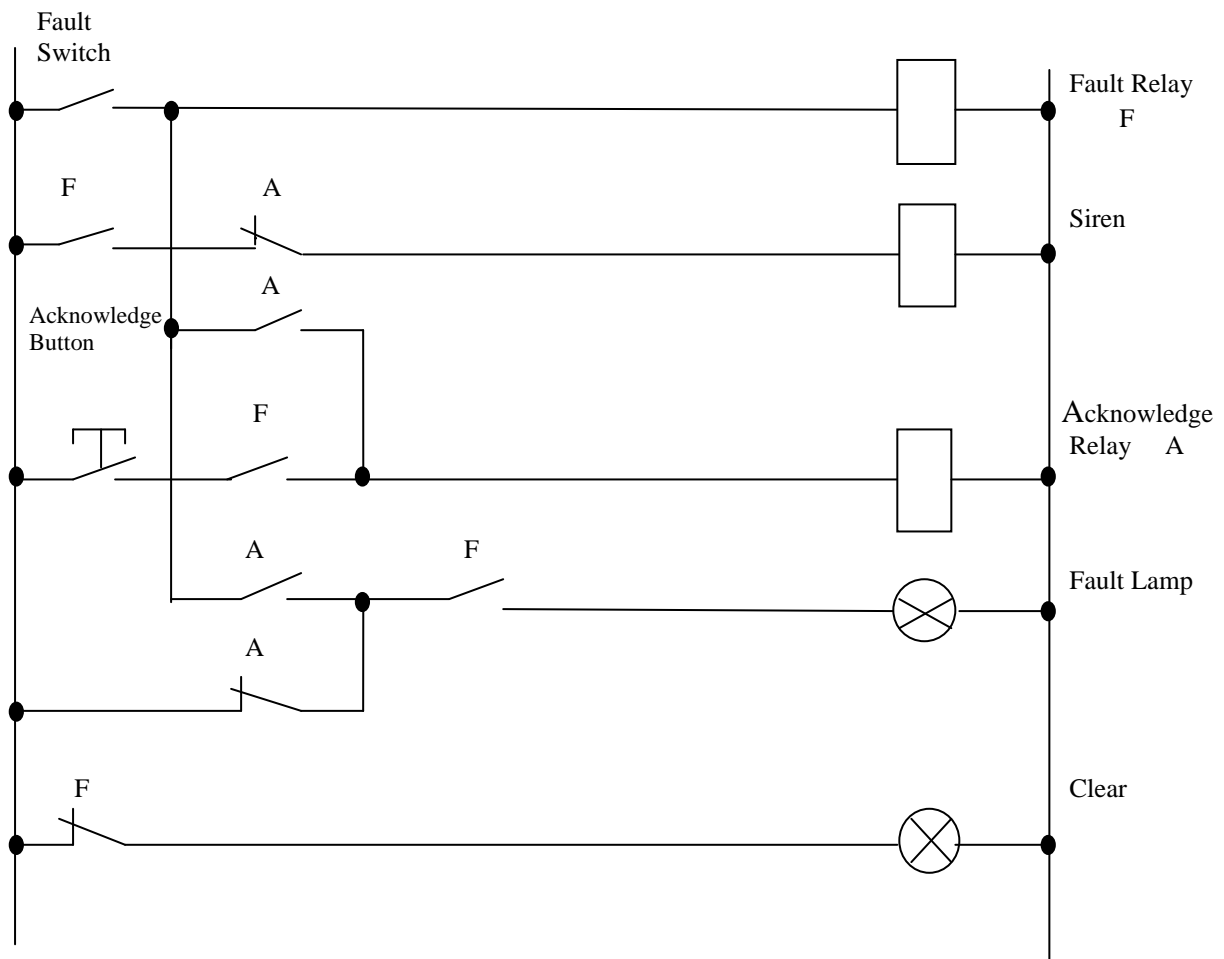
Question 3

Draw **a neat** the ladder diagram to indicate how one timer and one counter can be cascaded to provide a total time delay of 60 mins. Inputs available to you are X0, X1, and X2. Y0 will turn on at the end of the 60min minute period. Nominate counter and timer pre-sets.

(6 Marks)

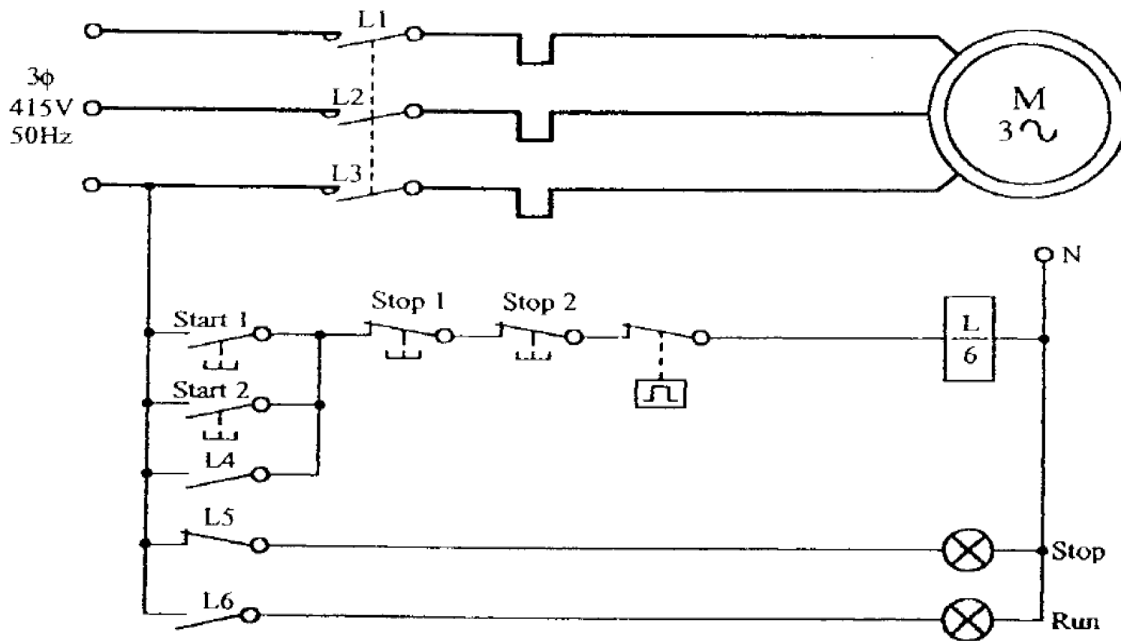
Question 4

Draw **a neat** ladder diagram for entry into a programmable controller of the relay circuit shown in figure 1 below. **(10 Marks)**



Question 5

Using the diagram given below **neatly draw** the connections required to connect all input and output devices to the programmable controller. (6 marks)



24 Volt DC POWER SUPPLY

24 Volt AC POWER SUPPLY

PLC



Question 6

Create a ladder diagram based on question 5 ready to enter into the programmable controller.
(3 marks)



Student Name:

Class:

Date:.....

UEENEEG109A Develop and Connect Electrical Control Circuits

Practical Assessment 1A

Time allowed – 1 hour and 30 minutes

3 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
Total	30	

Aids to be supplied by College: Those as listed on page 2 of this document

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

- Electronic devices are to be turned off and removed from your person
- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- You will be required to connect and operate an electrical control circuit
- The teacher will need to check your progress at various stages during this assessment.
You must not proceed until the teacher has signed off
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

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No	Yes	No	No	Yes	No	No

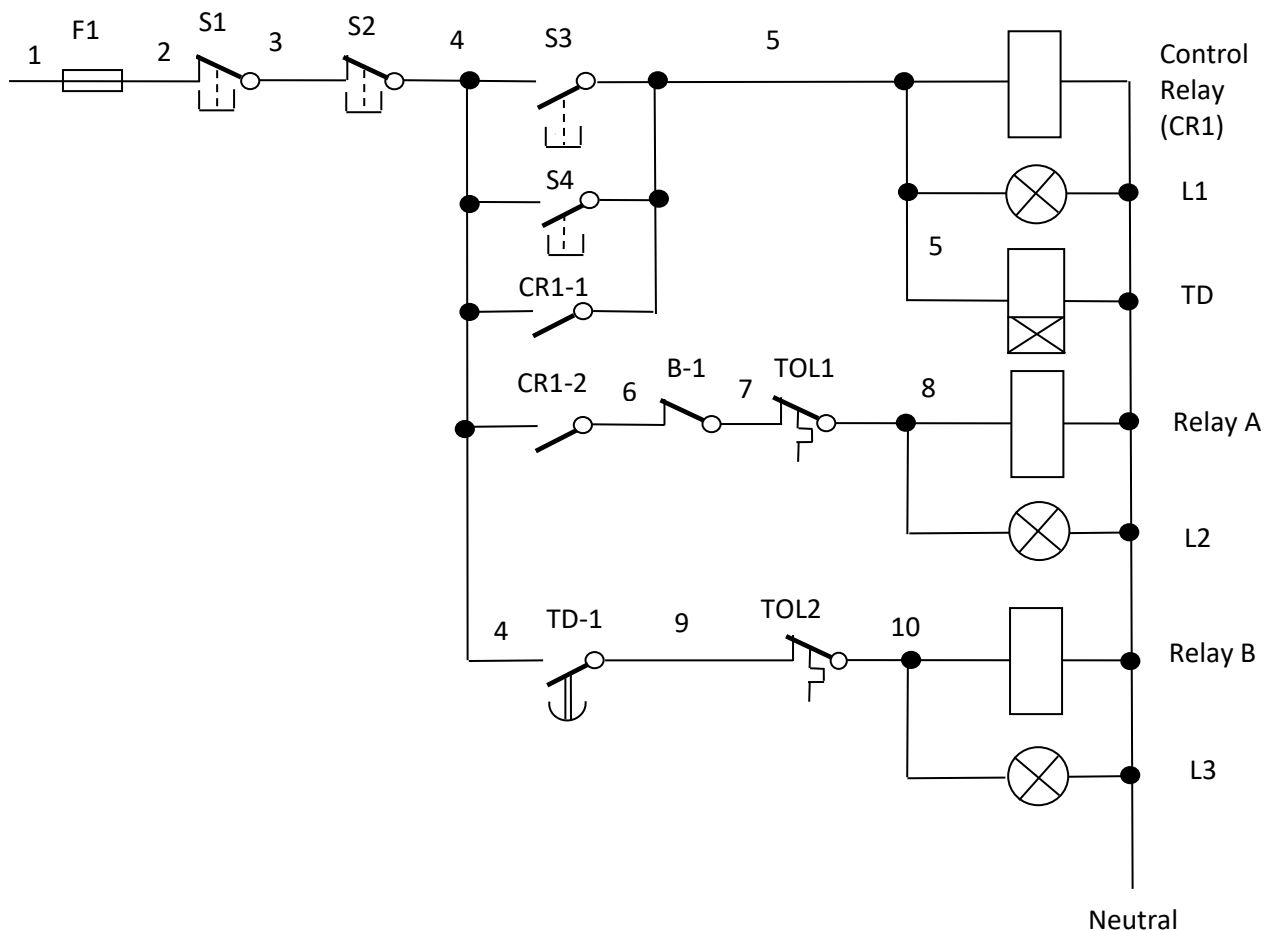
Verified by: Name: Signed:Date:

Question 1: (10 Marks)

Equipment:

- 2 x N/O pushbuttons
- 2 x N/C pushbuttons
- 2 x thermal overload units
- 1 x 24 Volt plug in relay and panel
- 2 x 24 volt contactors with 4 x N/O contacts
- 1 auxiliary contact block with at least 1 x N/C contact
- 1 x 24 volt “On Delay” timer
- 1 x fuse panel
- 1 x LED panel
- Leads

Construct the circuit and demonstrate its operation.



Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

2. Add a double pole Jog button to the circuit of the control relay and test the circuit.

Note: Do not connect the supply until the teacher has checked your circuit

Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

3. What is the purpose of the contact CR1.1 connected in parallel with S4? (2 marks)

4. What type of timer is shown in the circuit? (1 mark)

5. Explain the purpose of the N/C contact “B-1” in the circuit (2 marks)

6. If the timer fails to energise what will be the effect on the circuit (2 marks)

7. What do pushbuttons S1, S2, S3 & S4 form? (1 mark)

8. When the timer is de-energised after having been energised, explain how the timer contact will react. (2 marks)

Student Name : _____
Class : _____
Date: _____

UEE30811
Certificate III Electrotechnology

UEENEEG109A

Electrical Control Circuit

TEST 1A

Time allowed – 1 hour and 30 minutes

8 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

TOTAL MARKS AVAILABLE

SECTION	Possible Marks	Actual Marks
A	10	
B	40	
C	25	
TOTAL	75	

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Section A – (10 Marks)

Instructions: Select the best answer for the following statements and place the corresponding letter answer sheet provided. Each correct answer is worth one mark.

Question 1.

Another name for a schematic diagram :-

- (A) A wiring diagram
- (B) A block diagram
- (C) A circuit diagram
- (D) A rung diagram

Question 2.

The main purpose of a schematic diagram is to show:-

- (A) The route of the associated wiring
- (B) The equipment terminal numbers
- (C) How the equipment is to be mounted
- (D) The electrical operation of the equipment

Question 3.

In a basic stop/start relay circuit the latching contact is connected :-

- (A) In parallel with the stop button
- (B) In parallel with the start button
- (C) In series with the stop button
- (D) In series with the start button

Question 4.

When a normally open non latching pushbutton is pressed the contacts:-

- (A) Open until the button is released
- (B) Close and remain closed until the button is pressed again
- (C) Close as long as the button is pressed
- (D) Do not operate unless a retaining contact is connected in parallel

Question 5.

When an electrical relay is de-energised:

- (A) All contacts remain in the actuated state
- (B) The N/O contacts are open and the N/C contacts are closed
- (C) The coil is connected to the supply and all contacts change state
- (D) A pilot lamp supplied via a N/O contact will light

Question 6.

In a horizontally drawn circuit diagram:-

- (A) Energy flow is from top to bottom
- (B) Control devices are placed to the right of the diagram
- (C) All components and wiring are drawn horizontally
- (D) The sequence of events is from top to bottom

Question 7.

The contacts of an 'On delay' timer will:-

- (A) Open or close immediately the timer is energised
- (B) Open or close immediately the timer is de-energised
- (C) Open or close a set time after the timer is energised
- (D) Open or close a set time after the timer is de-energised

Question 8.

Jog or inch controls in a circuit allow:-

- (A) DOL operation
- (B) Limiting of starting currents
- (C) Small rotational movements of the motor
- (D) No automatic starting of the motor

Question 9.

Thermal Overload contacts will trip:-

- (A) When the power circuit draws excessive current
- (B) Inversely proportional to the current and time
- (C) Immediately the control circuit draws excessive current
- (D) After the temperature rise of the motor reaches 95°C

Question 10.

In a vertically drawn circuit diagram:-

- (A) Energy flow is from top to bottom
- (B) Control devices are placed to the right of the diagram
- (C) All components and wiring are drawn horizontally
- (D) The sequence of events is from top to bottom

Section B – (40 Marks)

Question 1.

List the specifications that must be considered to correctly select a relay for use in an electrical control circuit. *(4 marks)*

Question 2.

Certain conventions are followed when drawing electrical circuit diagrams. List the conventions followed when drawing a vertically oriented circuit diagram. *(4 marks)*

Question 3.

Explain the difference in operation between a manual switch and a pushbutton. *(3 marks)*

Question 4.

Briefly explain the difference between using detached symbols and semi-detached symbols in a circuit diagram. *(4 marks)*

Question 5.

Name four types of motor protection. *(4 marks)*

Question 6.

List the specifications that must be considered to correctly select a timer for use in an electrical control circuit.

Question 7.

Explain the meaning of the term 'Jog' or 'Inch' as applied to an electric motor. *(4 marks)*

Question 10.

Answer the following questions in regard to the operation of the control circuit shown in Figure 1. **(5 Marks)**

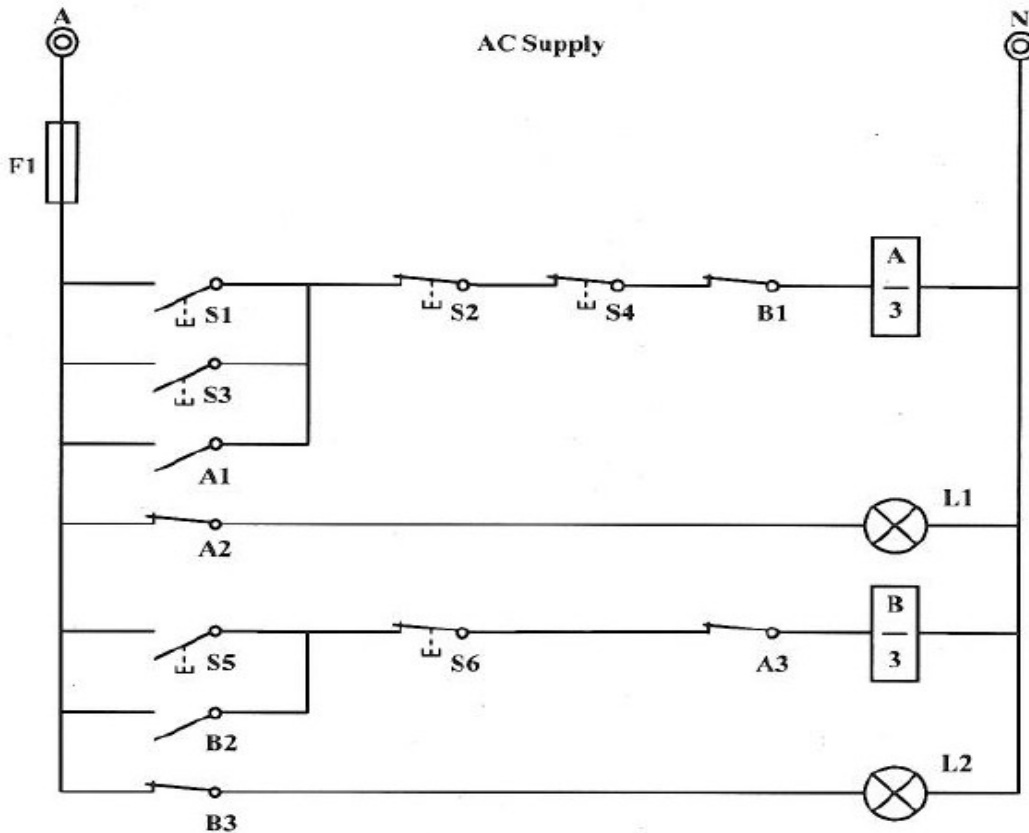


Figure 1

(a) Before any pushbutton is pressed what is the condition of Relay "B" and indicating lamp L1?

(b) If pushbutton S5 is pressed after relay 'A' is energised what will the effect be on contact A3, Relay 'B' and indicating lamp L3?

(c) The two contacts B1 and A3 provide

Student Name : _____

Class : _____

Date: _____

**2022 Certificate III Electrotechnology
Electrical Control Circuit
G109a
TEST 2A**

**Time allowed – 1 hour and 30 minutes
9 Pages in this Question Booklet**

Student Feedback/Comments

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TOTAL MARKS AVAILABLE

SECTION	Possible Marks	Actual Marks
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B	40	
C	20	
TOTAL	75	

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Section A – (15 Marks)

Instructions: Select the best answer for the following statements and place the corresponding letter in the answer sheet provided. Each correct answer is worth one mark.

Question 1.

The star and delta contactors in an automatic star-delta starter should be mechanically interlocked to prevent:-

- (A) Over speeding the motor
- (B) Motor starting
- (C) Short circuiting the supply
- (D) Over current

Question 2.

The relationship between the operating time and current of a thermal overload is known as the:-

- (A) time to current ration
- (B) inverse time characteristic
- (C) proportional time characteristic
- (D) trip time characteristic

Question 3.

The starting torque of a three phase induction motor varies:-

- (A) Directly with the applied voltage
- (B) Inversely with the applied voltage
- (C) Inversely with the speed of the motor
- (D) directly with the applied voltage squared

Question 4.

A three phase primary resistance starter connects the resistors:-

- (A) In series with the stator windings
- (B) In parallel with the stator windings
- (C) In series with the rotor
- (D) In parallel with the rotor

Question 5.

Thermistors located within the motor winding as a further protection against overload have a:-

- (A) zero temperature coefficient
- (B) negative temperature coefficient
- (C) positive temperature coefficient
- (D) variable temperature coefficient

Question 6.

During the acceleration of a squirrel cage induction motor the resistance of a primary resistance starter is:-

- (A) Gradually increased
- (B) Gradually decreased
- (C) Left unchanged
- (D) Alternately disconnected and reconnected to the motor

Question 7.

To reverse the direction of rotation of the three phase squirrel cage induction motor you would:-

- (A) Disconnect and reverse the slip ring connections
- (B) Change the delta connected stator to star connected
- (C) Replace the squirrel cage rotor with a slip ring rotor
- (D) Interchange any two of the supply lines

Question 8.

The thermal overload contact in a control circuit is:-

- (A) Normally closed
- (B) Normally open
- (C) Spring loaded normally open
- (D) Spring loaded normally closed

Question 9.

Thermal Overload contacts will trip:-

- (A) When the power circuit draws excessive current
- (B) Inversely proportional to the current and time
- (C) Immediately the control circuit draws excessive current
- (D) After the temperature rise of the motor reaches 95°C

Question 10.

The effect of reducing the applied voltage to a motor will be to:-

- (A) Reduce starting current while increasing starting torque
- (B) Reduce starting current and starting torque
- (C) Increase the starting current while reducing starting torque
- (D) Increase starting current and starting torque

Question 11.

When using a star-delta starter the voltage applied to each phase of a three phase motor during the starting phase will be:-

- (A) 3 times the line voltage
- (B) equal to the line voltage
- (C) $1/3$ times the line voltage
- (D) $1/\sqrt{3}$ times the line voltage

Question 12.

A star delta starter is used to start a three phase squirrel cage induction motor, after 10 minutes the motor is running hot and slow, the most likely fault is:-

- (A) Low insulation resistance
- (B) Open circuit coil
- (C) Faulty timer
- (D) Broken earth wire

Question 13.

For star-delta starting the number of terminals required at the induction motor terminal block is:-

- (A) 2
- (B) 3
- (C) 4
- (D) 6

Question 14.

When using a secondary resistance starter with a three phase induction motor the starting resistors are:

- (A) connected in series with the stator windings
- (B) connected in parallel with the stator windings
- (C) connected in series with the rotor winding
- (D) connected in parallel with the rotor windings

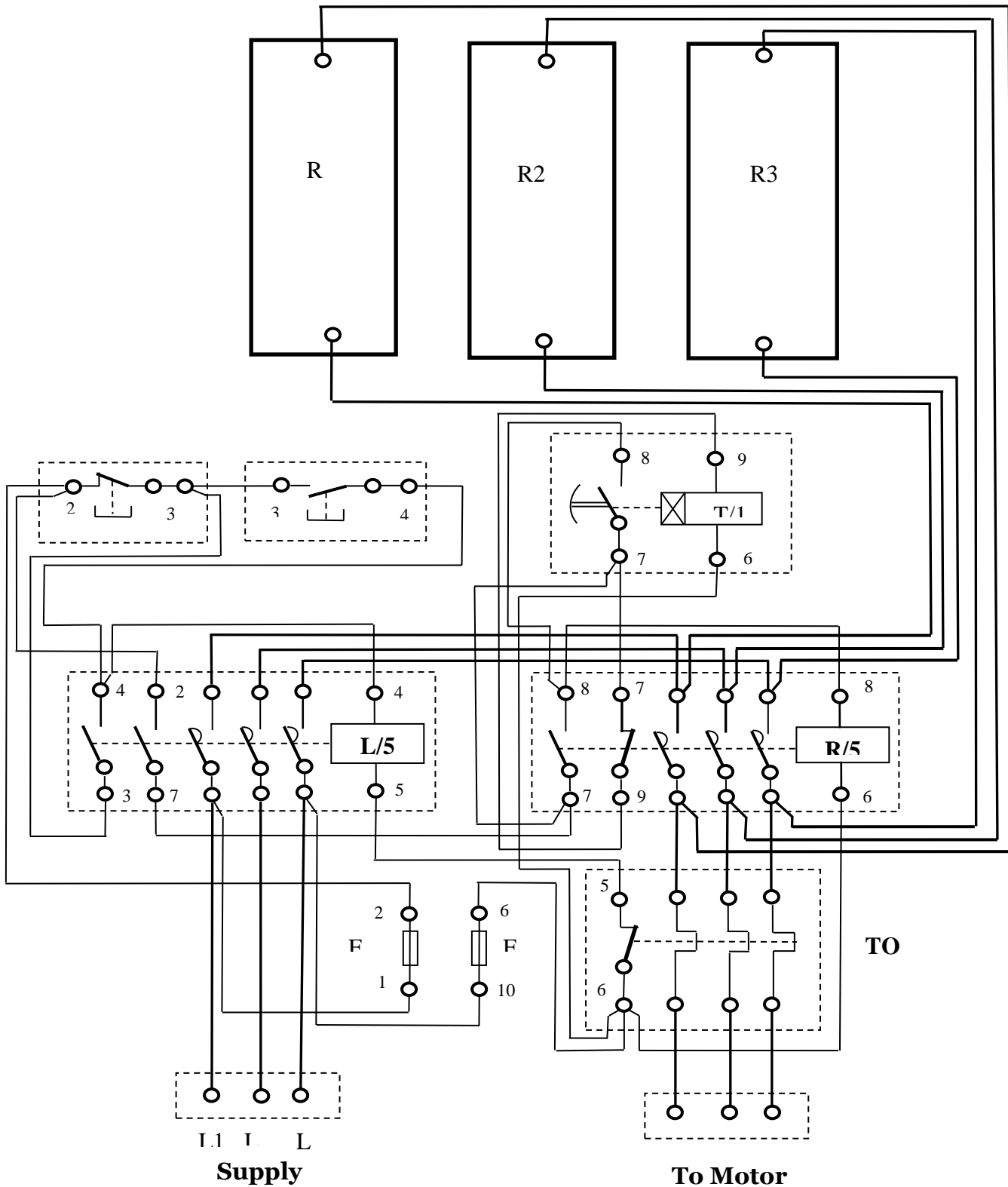
Question 15.

An auto transformer starter is used to start a three phase squirrel cage induction motor. If the torque of the motor when started DOL is 54 Nm the torque of the motor at start when using the 60% tapping of the auto transformer will be:

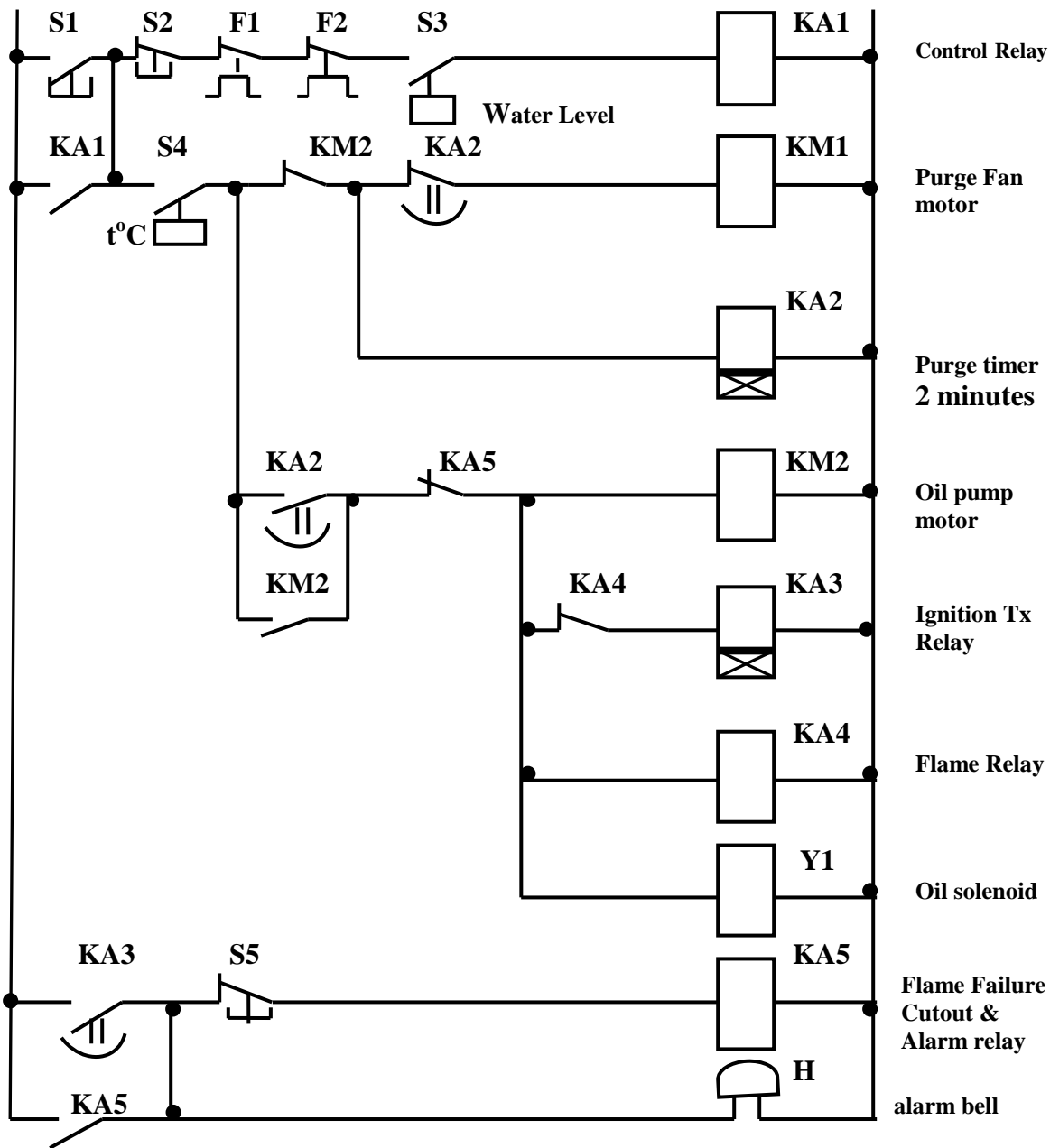
- (A) 60% of the DOL value
- (B) equal to the DOL value
- (C) 36% of the DOL Value
- (D) 57% of the DOL value

Section B – (40 Marks)

Question 1. Convert the Wiring diagram of figure 1 below to a circuit diagram. Include the power and control circuits, line and wire numbering, and all labelling. *(24 Marks)*



Question 3. Answer the following questions in regard to the operation of the control circuit shown in Figure 2 below.



Assuming all conditions have been met to allow the circuit to operate answer the following questions

(a) What is the function of the switch marked 'S3'? (3 marks)

(b) If the contacts marked 'KA2' operate what effect will there be on the circuit?
(3 Marks)

(c) Explain the effect of closing contact 'KA3'. (3 Marks)

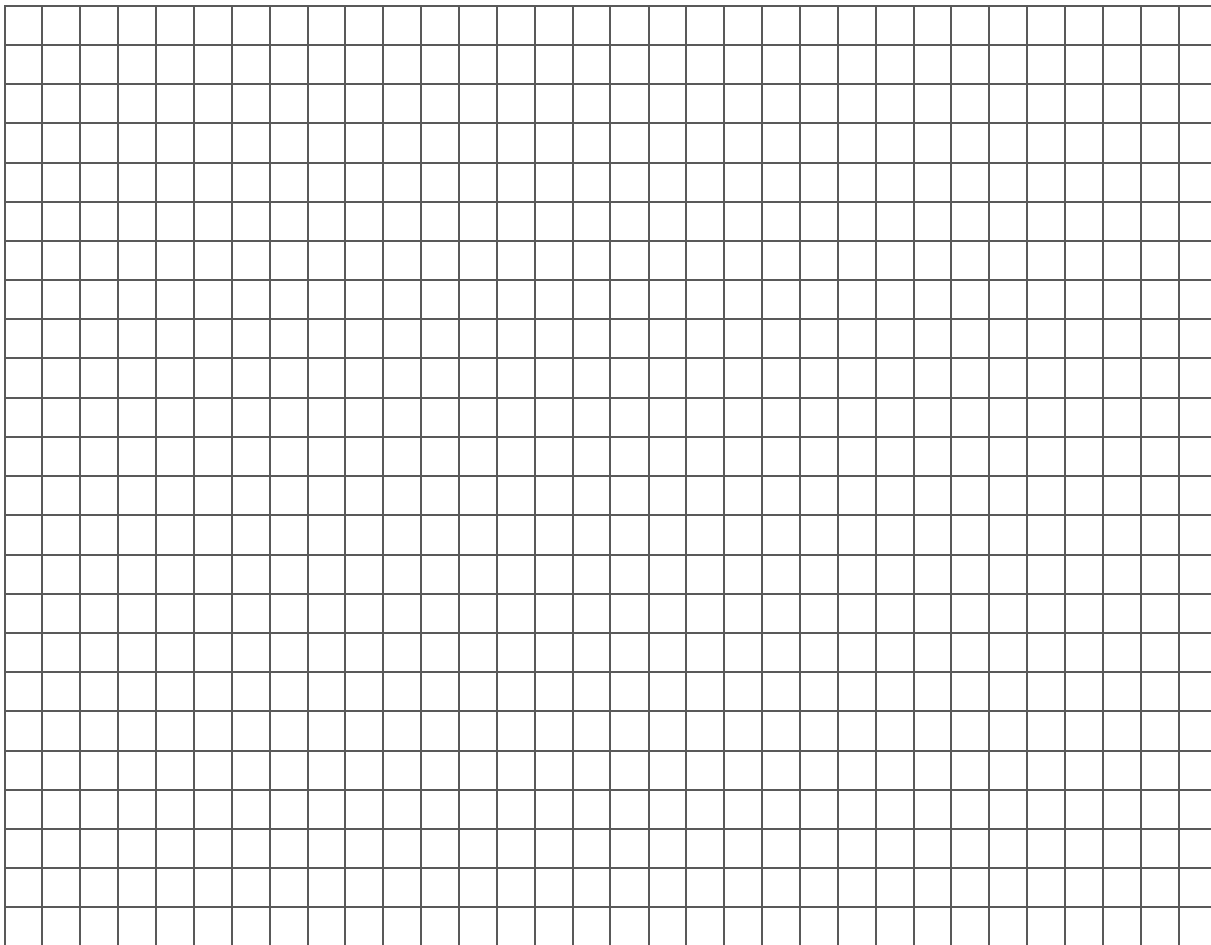
(d) Explain the purpose of the N/C contact 'KA4'. (3 Marks)

(c) The circuit shown in figure 2 involves sequencing. Describe how sequencing is achieved in this circuit.
(4 Marks)

Section C – (20 Marks)

On the grid paper provided, using a neat freehand sketch, draw the power and control circuit to satisfy the following operational criteria.

- A three phase delta connected squirrel cage induction motor is connected to run in forward or reverse direction. Three push buttons are used to provide control for the motor. S1 – forward, S2 – reverse and S3 is the only stop button. The motor is protected by a thermal overload.
- When power is first applied and before any pushbutton is pressed all relays will be de-energised.
- Pressing pushbutton S1 will cause the motor to start and run in the forward direction.
- When the stop button is pressed there must be a 15 second delay before the motor can be restarted in reverse by pressing button S2.
- Number each wire and line in the circuit diagram
- Label all relays, contactors, timers, contacts, and pushbuttons.





Student Name:

Class:

Date:.....

UEENEEG109A Develop and Connect Electrical Control Circuits

Practical Assessment 1A

Time allowed – 1 hour and 30 minutes

3 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
Total	30	

Aids to be supplied by College: Those as listed on page 2 of this document

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

- Electronic devices are to be turned off and removed from your person
- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- You will be required to connect and operate an electrical control circuit
- The teacher will need to check your progress at various stages during this assessment.
You must not proceed until the teacher has signed off
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

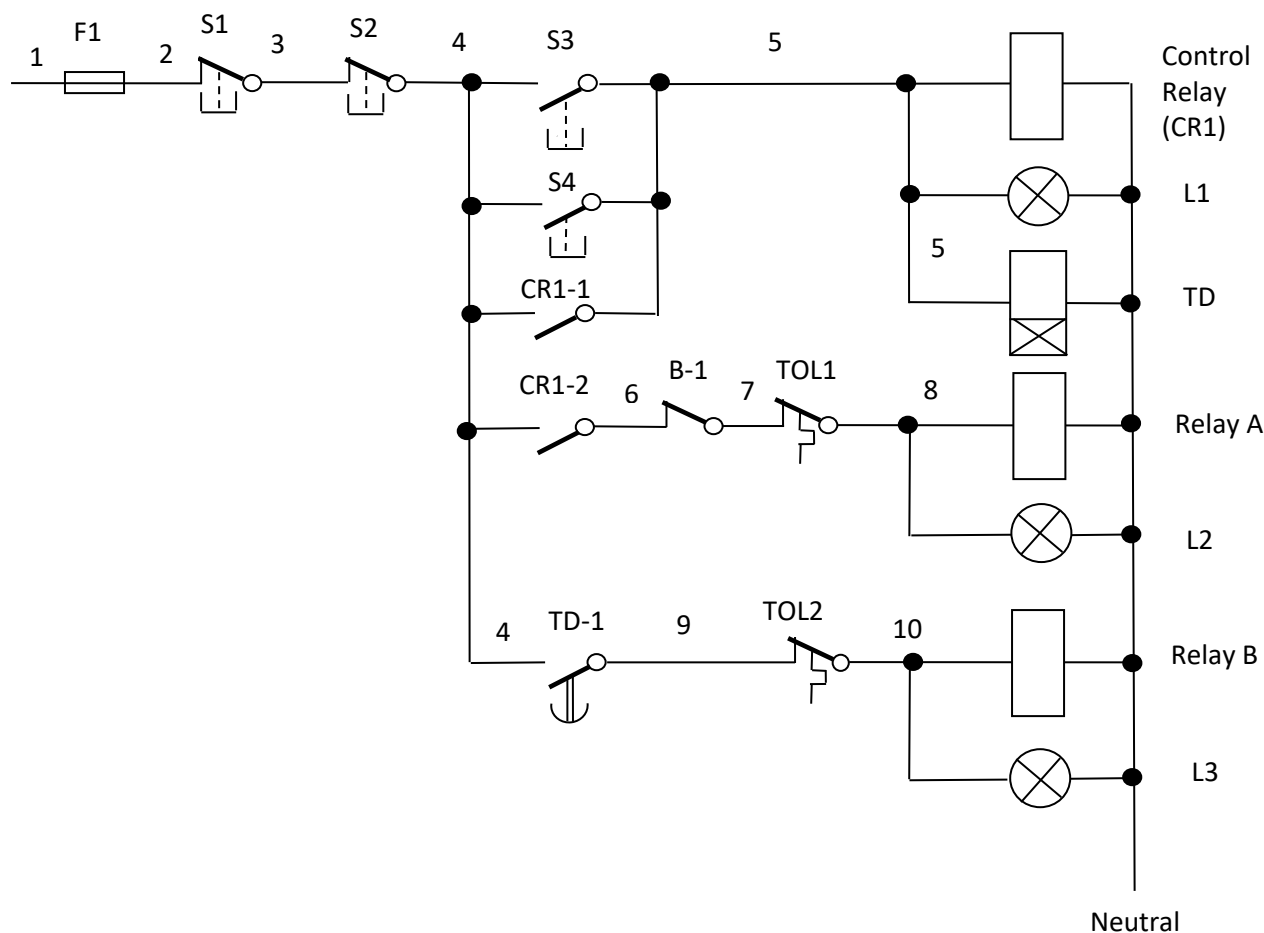
Verified by: Name: Signed:Date:

Question 1: (10 Marks)

Equipment:

- 2 x N/O pushbuttons
- 2 x N/C pushbuttons
- 2 x thermal overload units
- 1 x 24 Volt plug in relay and panel
- 2 x 24 volt contactors with 4 x N/O contacts
- 1 auxiliary contact block with at least 1 x N/C contact
- 1 x 24 volt “On Delay” timer
- 1 x fuse panel
- 1 x LED panel
- Leads

Construct the circuit and demonstrate its operation.



Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

2. Add a double pole Jog button to the circuit of the control relay and test the circuit.

Note: Do not connect the supply until the teacher has checked your circuit

Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

3. What is the purpose of the contact CR1.1 connected in parallel with S4? (2 marks)

4. What type of timer is shown in the circuit? (1 mark)

5. Explain the purpose of the N/C contact “B-1” in the circuit (2 marks)

6. If the timer fails to energise what will be the effect on the circuit (2 marks)

7. What do pushbuttons S1, S2, S3 & S4 form? (1 mark)

8. When the timer is de-energised after having been energised, explain how the timer contact will react. (2 marks)



Student Name:

Class:

Date:.....

UEENEEG109A Develop and Connect Electrical Control Circuits

Practical Assessment 2B

Time allowed – 1 hour and 30 minutes

3 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
Q1	10	
Q2	10	
Q3-8	10	
Total	30	

Aids to be supplied by College: Those as listed on page 2 of this document

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

- Electronic devices are to be turned off and removed from your person
- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- You will be required to connect and operate an electrical control circuit
- The teacher will need to check your progress at various stages during this assessment.
You must not proceed until the teacher has signed off
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Verified by: Name: Signed:Date:

Question 1: (10 Marks)

Equipment:

- 2 x N/O pushbuttons
- 2 x N/C pushbuttons
- 2 x thermal overload units
- 1 x 24 Volt plug in relay and panel
- 2 x 24 volt contactors with 4 x N/O contacts
- 1 auxiliary contact block with at least 1 x N/C contact
- 1 x 24 volt “On Delay” timer
- 1 x fuse panel
- 1 x LED panel
- Leads

Construct the circuit and demonstrate its operation.

Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

2. Add a double pole Jog button to the circuit of the control relay in both directions and test the circuit.

Note: Do not connect the supply until the teacher has checked your circuit

Attempt 1	Attempt 2	Teacher assist
10 marks	5 marks	0 marks

3. What is the purpose of the contact “R5” connected in the control circuit?
(2 marks)

4. What type of timer is shown in the circuit? (1 mark)

5. Explain the purpose of the contact labelled “F5” in the control circuit mean?
(2 marks)

6. If the timer fails to energise what will be the effect on the circuit (2 marks)

7. What does the symbol marked -----Δ----- shown above in the power circuit mean?
(1 mark)

8. What would be the effect on the circuit if contactor “F” failed to energise (2 marks)



Student Name:

Class:

Date:.....

**UEENEEG109A Develop and Connect Electrical Control Circuits
Practical Assessment 3B**

**Time allowed – 1.5 hours
2 Pages in this Question Booklet**

Student Feedback/Comments Total Marks Available

The results of my performance have been discussed and explained to me.			
Student		Date	
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.			
Teacher		Date	

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Aids to be supplied by College:

- Koyo DL05 Programmable Controller
- Laptop Computer and interface cable
- All other required input & output devices

Aids to be supplied by student:

- Pen, pencil, rule and calculator

Instructions to Students:

- Electronic devices are to be turned off and removed from your person
- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- You will be required to connect and operate an electrical control circuit
- The teacher will need to check your progress at various stages during this assessment. ***You must not proceed until the teacher has signed off***
- ***You may use your TAFE workbook in this assessment for reference to programming details***
- When connecting and disconnecting components within the circuit the student is to ensure proper isolation techniques are followed. No connection or disconnection is to be carried out on a live circuit.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Verified by: Name: Signed:Date:

Question 1: (25 Marks)

Enter the following program into the Koyo PLC. After the program has been fully entered, save the program to the memory ready for testing. The system is to be wired and demonstrated.

- A motor control circuit has a stop/start station.
- The motor is protected by a thermal overload.
- The circuit has run and stop lights.
- The circuit has a counter to trace the number of motor starts and can only be reset with a maintenance switch (press button).
- The circuit has a system enable light that will come on 15 seconds after motor starts.
- After 30 seconds the system will shut down automatically.



Student Name:

Class: **marking guide**

Date:.....

2022 Certificate III Electrotechnology

UEENEEG109A Develop and Connect Electrical Control Circuits

Theory Assessment 2A marking guide

Time allowed – 1 hour and 30 minutes

12 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
A	20	
B	25	
C	10	
D	20	
Total	75	

Aids to be supplied by College: Nil

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

- Electronic devices are to be turned off and removed from your person
- You cannot access an electronic device during this examination
- All questions are to be answered in the space provided in this Question Booklet
- All questions are to be answered in the space provided in this question booklet. Answers to Section A (multi-choice questions) are to be recorded on the answer sheet attached to this booklet
- You are not to use any reference book in this examination
- The whole of this question booklet is to be handed to the supervisor upon completion.

Aids permitted where indicated:

Standard Dictionaries	Bilingual Dictionaries	Technical Dictionaries	Programmable Calculators	Non-programmable Calculators	Mobile Phones	MP3 Players
No	Yes	No	No	Yes	No	No

Verified by: Name: Signed:Date:

Section A

Instructions: Select the best answer for the following statements and mark the corresponding box in the answer sheet provided. Each correct answer is worth one mark.

Question 1:

The star and delta contactors in an automatic star-delta starter should be mechanically interlocked to prevent:

- A) Over speeding the motor
- B) Motor starting
- C) Short circuiting the supply**
- D) Over current

Question 2:

Fail safe braking of an electric motor is where:

- A) An operator is present at all times during the operation of the motor
- B) An electro-mechanical brake is used to stop and hold the motor**
- C) Two switches must be pressed simultaneously
- D) Is another name for dynamic braking.

Question 3:

The starting torque of a three phase induction motor varies:

- A) Directly with the applied voltage
- B) Inversely with the applied voltage
- C) Inversely with the speed of the motor
- D) Directly with the applied voltage squared.**

Question 4:

A three phase primary resistance starter connects the resistors:

- A) In series with the stator windings**
- B) In parallel with the stator windings
- C) In series with the rotor
- D) In parallel with the rotor.

Question 5:

Thermistors located within the motor winding as a further protection against overload have a:

- A) Zero temperature coefficient
- B) Positive temperature coefficient**
- C) Negative temperature coefficient
- D) Variable temperature coefficient.

Question 6:

During the acceleration of a squirrel cage induction motor the resistance of a primary resistance starter is:

- A) Gradually increased
- B) Gradually decreased
- C) Left unchanged**
- D) Alternatively disconnected then reconnected to the motor.

Question 7:

To reverse the direction of rotation of a squirrel cage induction motor you would:

- A) Disconnect and reverse the slip ring connections
- B) Change the delta connected stator to a star connected
- C) Replace the squirrel cage motor with a slip ring motor
- D) Interchange any two of the supply lines.**

Question 8:

The thermal overload contact in a control circuit is:

- A) Normally closed**
- B) Normally open
- C) Spring loaded normally open
- D) Spring loaded normally closed.

Question 9:

Thermal overload contacts will trip:

- A) When the power circuit draws excessive current
- B) Inversely proportional to current and time
- C) Immediately the control circuit draws excessive current
- D) After the temperature rise of the motor reaches 95°C.

Question 10:

The effect of reducing the applied voltage to a motor will be to:

- A) Reduce starting current while increasing starting torque
- B) Reduce starting current and starting torque
- C) Increase starting current while reducing starting torque
- D) Increase starting current and starting torque.

Question 11:

When using a star-delta starter the voltage applied to each phase of a three phase motor during the starting phase will be:

- A) 3 times the line voltage
- B) Equal to the line voltage
- C) 1/3 times the line voltage
- D) $1/\sqrt{3}$ times the line voltage.

Question 12:

A star-delta starter is used to start a three phase squirrel cage induction motor, after 10 minutes the motor is running hot and slow, the most likely fault is:

- A) Low insulation resistance
- B) Open circuit coil
- C) Faulty timer
- D) Broken earth wire.

Question 13:

For star-delta starting the number of terminals required at the induction motor terminal block is:

- A) 2
- B) 3
- C) 4
- D) 6.

Question 14:

When using a secondary resistance starter with a three phase induction motor the starting resistors are:

- A) Connected in series with the stator windings
- B) Connected in parallel with the stator windings
- C) Connected in series with the rotor windings
- D) Connected in parallel with the rotor windings

Question 15:

An auto transformer starter is used to start a three phase squirrel cage induction motor. If the torque of the motor when started D.O.L. is 54 Nm the torque of the motor at start when using the 60% tapping of the auto transformer starter is:

- A) 60% of the D.O.L. value
- B) Equal to the D.O.L. value
- C) 36% of the D.O.L. value
- D) 57% of the D.O.L. value.

Question 16:

The method of braking that returns power to the supply is:

- A) dynamic
- B) plugging
- C) regenerative
- D) electro-mechanical.

Question 17:

If the supply voltage of a V.F. drive is not reduced with the frequency, the result will be:

- a) A decrease in speed
- b) A reduction in the air gap flux**
- c) Motor overheating
- d) An increase in speed.

Question 18:

Soft starters limit the starting current of a motor by:

- A) Controlling the triggering angle of S.C.R.s
- B) Placing liquid resistors in series with the stator**
- C) Placing reactors in series with the stator
- D) Controlling the frequency of the supply.

Question 19:

The preferred starter for a 300kW motor is:

- A) Half wave controller**
- B) Full wave controller
- C) A starter is not used on a 300kW motor
- D) None of the above.

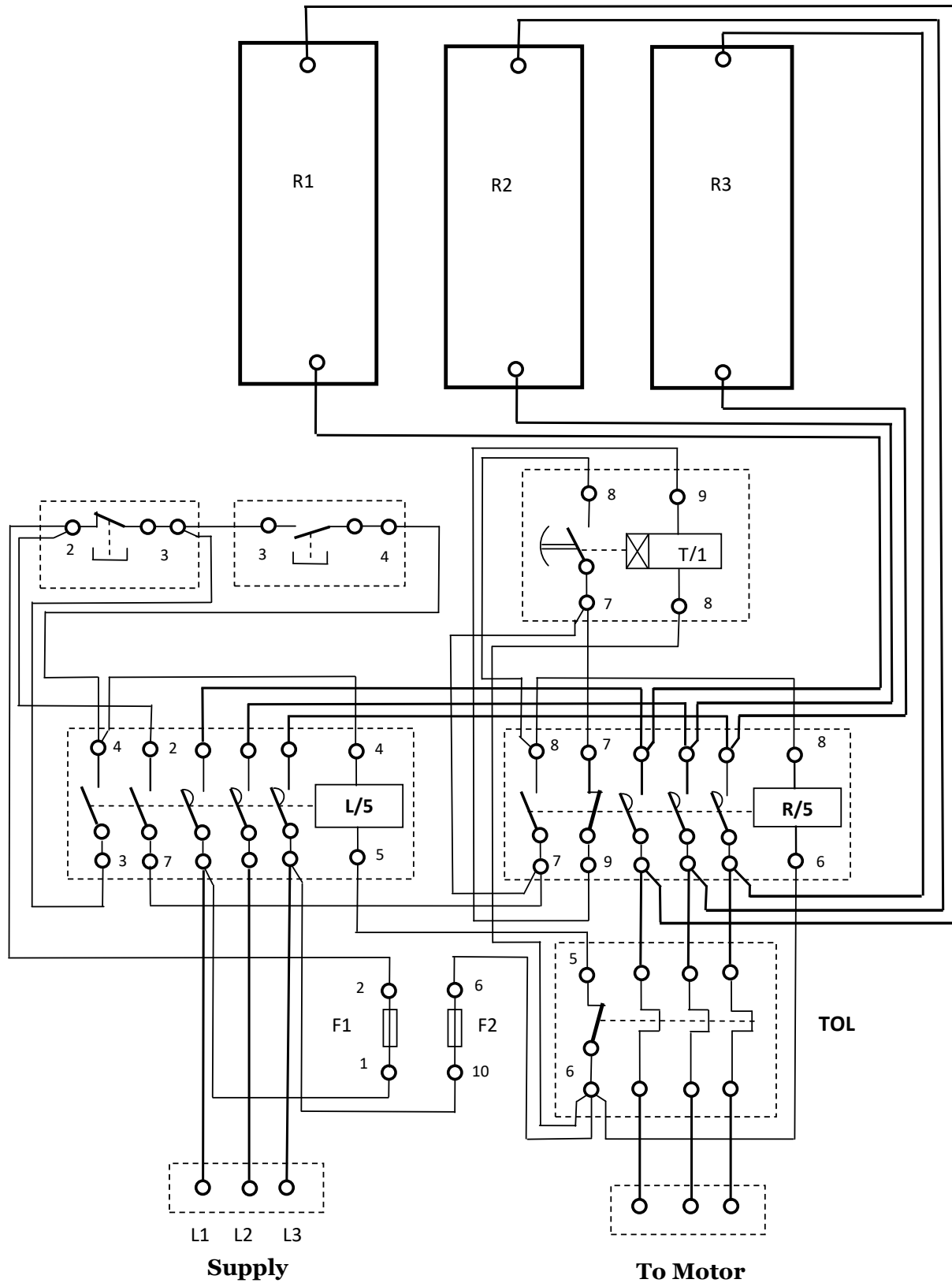
Question 20:

A Consequent Pole motor has:

- A. Two speeds**
- B. Four speeds
- C. Variable speeds
- D. Two poles.

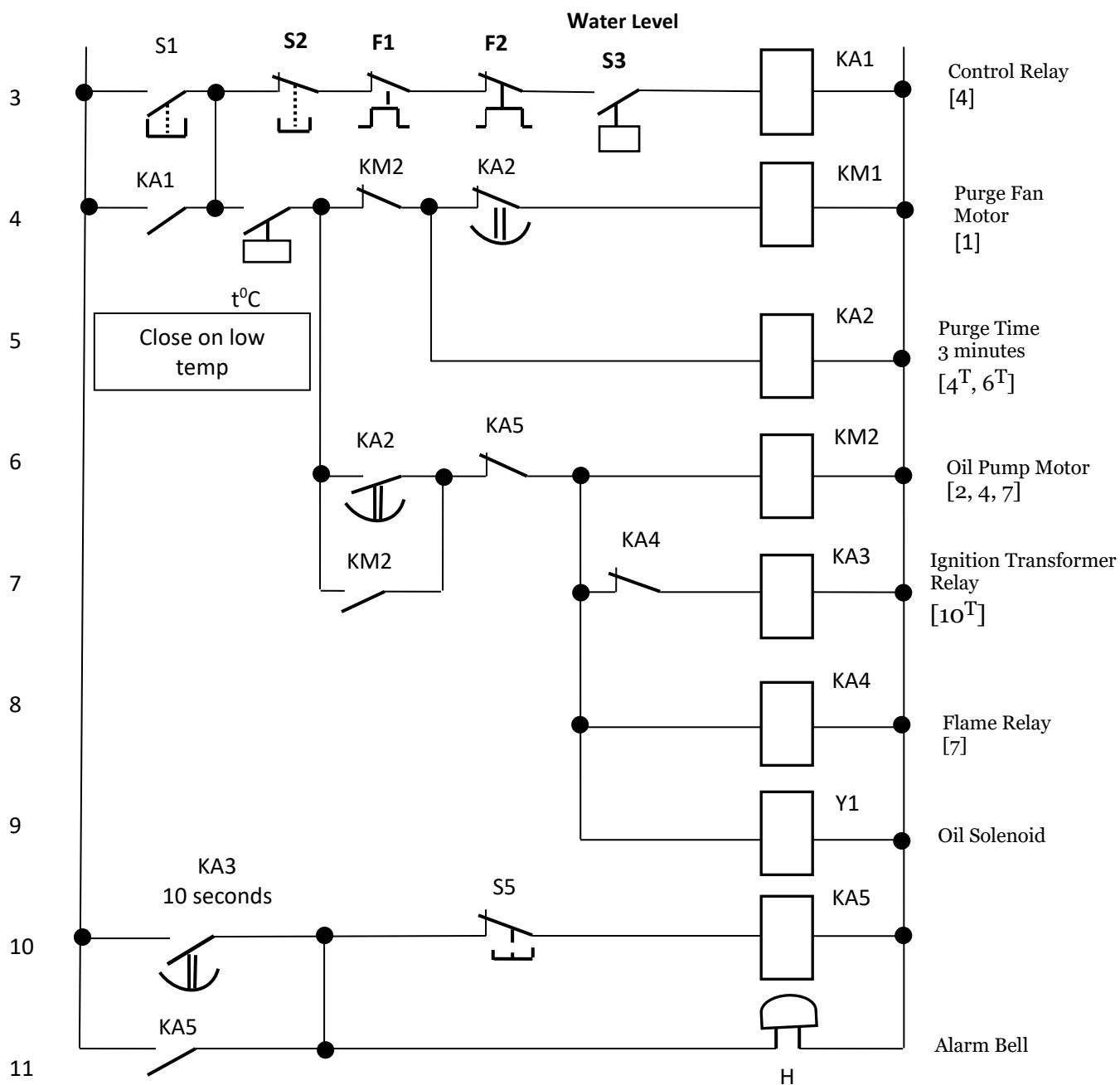
Section B: Diagrams (25 Marks)

Question 1: Convert the wiring diagram of figure 1 below to a circuit diagram. Include the power and control circuits, line and wire numbers and all labelling.



Circuit diagram for Section B, question 1.

Question 2: Answer the following questions in regard to the operation of the control circuit shown in figure 2 below.



Assuming all conditions has been met to allow the circuit to operate answer the following questions.

a) What is the function of the switch marked “S3” ? (2 marks)

To stop the function of the circuit if the water level is too low

b) When the contacts marked “KA2” operate what effect will there be on the circuit? (2 marks)

it will stop the purge fan motor after a delay
it will bring in the circuit for the oil pump

c) Explain the effect of closing the contact “KA3”. (3 marks)

the alarm circuit will activate

d) Explain the purpose of the N/C contact “KA4”.

It will deactivate the ignition transformer relay

Section C. Short Answer Questions (10 marks)

Question 1. (3 marks)

Name three types of variable speed drives.

1. Star-delta
2. Variable resistor (primary)
3. Auto-transformer

Question 2. (3 marks)

List three advantages of a variable speed drive over a D.O.L. starter.

1. Limits the stator current on start up
2. Allows the supply authority to limit starting times and currents
3. Varies the torque on start up

Question 3. (2 marks)

What type of motor is used for a secondary resistance starter?

Three phase slip ring motor

Question 4. (2 marks)

Name two types of electrical diagram used in the electrical industry?

1. schematic
2. wiring

Section D. (20 marks)

In the space below, using a neat freehand sketch, draw the power and control circuit to satisfy the following operational criteria.

- A three phase squirrel cage induction motor is connected to run in a forward or reverse direction. Three push buttons are used to provide control for the motor. S1 (forward), S2 (reverse) and S3 being the only stop button. The motor is protected by a thermal overload
- When the power is first applied and before any push button is pressed all relays will be de-energised
- Pressing pushbutton S1 will cause the motor to start and run in the forward direction
- When the stop button is pressed there must be a 15 second delay before the motor can be restarted in reverse by pressing button S2.
- Number each wire and line in the circuit
- Label all relays, contactors, timers, contacts and pushbuttons.



Student Name:

Class:

Date:.....

2022 Certificate III Electrotechnology

UEENEEG109A Develop and Connect Electrical Control Circuits

Theory Assessment 2A

Time allowed – 1 hour and 30 minutes

12 Pages in this Question Booklet

Student Feedback/Comments

The results of my performance have been discussed and explained to me.			
Student:		Date:	
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.			
Teacher:		Date:	

Total Marks Available:

	Possible Marks	Actual Marks
A	20	
B	25	
C	10	
D	20	
Total	75	

Aids to be supplied by College: Nil

Aids to be supplied by student: Pen, pencil, rule and calculator

Instructions to Students:

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No	Yes	No	No	Yes	No	No

Verified by: Name: Signed:Date:

Section A

Instructions: Select the best answer for the following statements and mark the corresponding box in the answer sheet provided. Each correct answer is worth one mark.

Question 1:

The star and delta contactors in an automatic star-delta starter should be mechanically interlocked to prevent:

- A) Over speeding the motor
- B) Motor starting
- C) Short circuiting the supply
- D) Over current

Question 2:

Fail safe braking of an electric motor is where:

- A) An operator is present at all times during the operation of the motor
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Thermistors located within the motor winding as a further protection against overload have a:

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During the acceleration of a squirrel cage induction motor the resistance of a primary resistance starter is:

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Thermal overload contacts will trip:

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The effect of reducing the applied voltage to a motor will be to:

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- A) 3 times the line voltage
- B) Equal to the line voltage
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A star-delta starter is used to start a three phase squirrel cage induction motor, after 10 minutes the motor is running hot and slow, the most likely fault is:

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- D) Broken earth wire.

Question 13:

For star-delta starting the number of terminals required at the induction motor terminal block is:

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- B) 3
- C) 4
- D) 6.

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When using a secondary resistance starter with a three phase induction motor the starting resistors are:

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Question 15:

An auto transformer starter is used to start a three phase squirrel cage induction motor. If the torque of the motor when started D.O.L. is 54 Nm the torque of the motor at start when using the 60% tapping of the auto transformer starter is:

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- C) 36% of the D.O.L. value
- D) 57% of the D.O.L. value.

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The method of braking that returns power to the supply is:

- A) dynamic
- B) plugging
- C) regenerative
- D) electro-mechanical.

Question 17:

If the supply voltage of a V.F. drive is not reduced with the frequency the result will be:

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- C) Placing reactors in series with the stator
- D) Controlling the frequency of the supply.

Question 19:

The preferred starter for a 300kW motor is:

- A) Half wave controller
- B) Full wave controller
- C) A starter is not used on a 300kW motor
- D) None of the above.

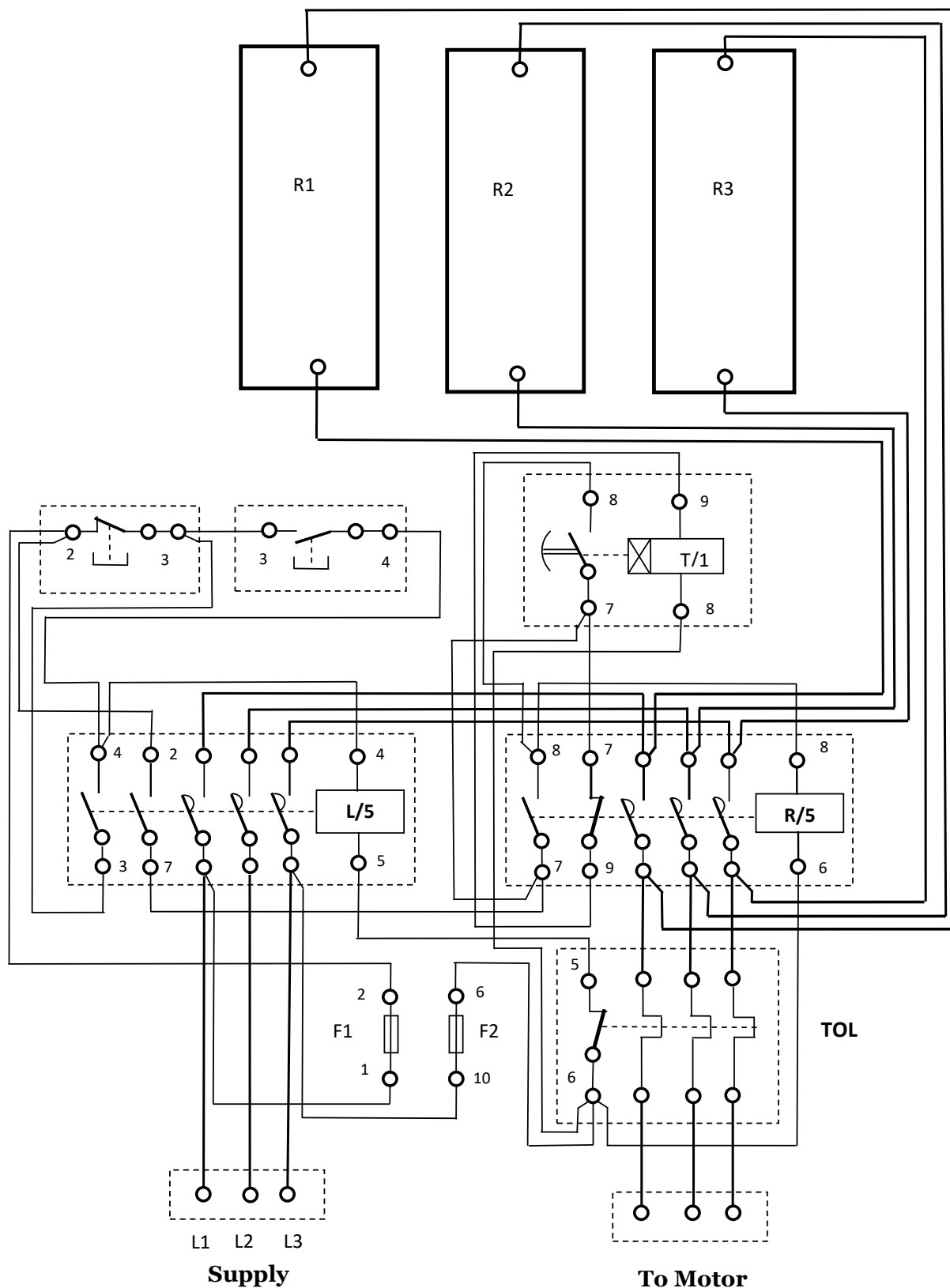
Question 20:

A Consequent Pole motor has:

- A) Two speeds
- B) Four speeds
- C) Variable speeds
- D) Two poles.

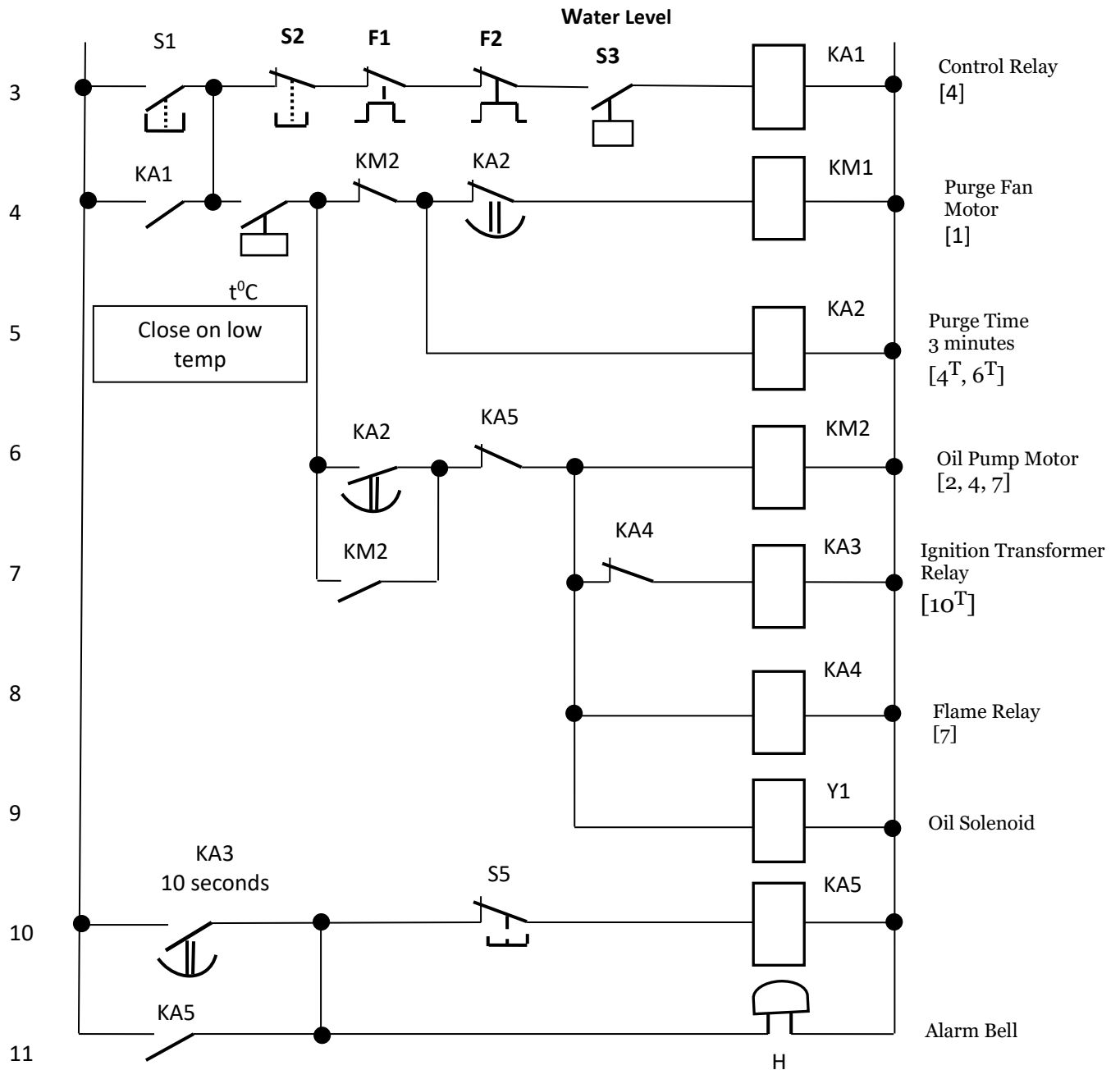
Section B: Diagrams (25 Marks)

Question 1: Convert the wiring diagram of figure 1 below to a circuit diagram. Include the power and control circuits, line and wire numbers and all labelling.



Circuit diagram for Section B, question 1.

Question 2: Answer the following questions in regard to the operation of the control circuit shown in figure 2 below.



Section C. Short Answer Questions (10 marks)

Question 1. (3 marks)

Name three types of variable speed drives.

- 1.
- 2.
- 3.

Question 2. (3 marks)

List three advantages of a variable speed drive over a D.O.L. starter.

- 1.
- 2.
- 3.

Question 3. (2 marks)

What type of motor is used for a secondary resistance starter?

Question 4. (2 marks)

Name two types of electrical diagram used in the electrical industry?

- 1.
- 2.

Section D. (20 marks)

In the space below, using a neat freehand sketch, draw the power and control circuit to satisfy the following operational criteria.

- A three phase squirrel cage induction motor is connected to run in a forward or reverse direction. Three push buttons are used to provide control for the motor. S1 (forward), S2 (reverse) and S3 being the only stop button. The motor is protected by a thermal overload
- When the power is first applied and before any push button is pressed all relays will be de-energised
- Pressing pushbutton S1 will cause the motor to start and run in the forward direction
- When the stop button is pressed there must be a 15 second delay before the motor can be restarted in reverse by pressing button S2.
- Number each wire and line in the circuit
- Label all relays, contactors, timers, contacts and pushbuttons.

Student Name : _____

Class : _____

ANSWER SHEET

Section A (Multi-choice Questions)

Instructions:

Enter your personal details in the top right hand corner of this sheet.
Place an **X** in box of your choice. If you make a mistake, circle your answer **⊗** and choose again.

Question	A.	B.	C.	D.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Totals				

Question	A.	B.	C.	D.
11				
12				
13				
14				
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17				
18				
19				
20				
Totals				

Total Marks Section A: _____