

Electrotechnology

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black pen
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of pages 9, 11 and 13

Total marks – 80

Section I Pages 2–6

15 marks

- Attempt Questions 1–15
- Allow about 20 minutes for this section

Section II Pages 9–15

35 marks

- Attempt Questions 16–21
- Allow about 50 minutes for this section

Section III Page 17

15 marks

- Attempt Question 22
- Allow about 25 minutes for this section

Section IV Page 18

15 marks

- Attempt Question 23
- Allow about 25 minutes for this section

Section I

15 marks

Attempt Questions 1–15

Allow about 20 minutes for this section

Use the multiple-choice answer sheet for Questions 1–15.

- 1 To what does the rating IP56 refer?
- (A) Total load
 - (B) Weatherproofing
 - (C) Mechanical strength
 - (D) Current carrying capacity
- 2 What type of tool would be best to use on this fastener?



- (A) Vice grip
- (B) Multigrip pliers
- (C) Shifting spanner
- (D) Combination pliers

3 Three 12 V lamps of different wattage are connected in parallel.

What is the effect on the branch current and brightness of each lamp when the applied voltage is decreased?

	<i>Current</i>	<i>Brightness</i>
(A)	Decreases	Decreases
(B)	Decreases	Increases
(C)	Increases	Decreases
(D)	Increases	Increases

4 What is the potential difference across a 3.3 k Ω resistor as it passes 7.5 mA of current?

- (A) 2.475 V
- (B) 24.75 V
- (C) 247.5 V
- (D) 2475 V

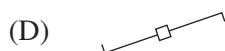
5 Which row of the table shows the essential personal protective equipment (PPE) and environmental requirements when using a soldering iron?

	<i>PPE</i>	<i>Environmental requirements</i>
(A)	Hearing protection	Safety barrier
(B)	Safety eyewear	Safety barrier
(C)	Safety eyewear	Ventilation
(D)	Hearing protection	Ventilation

6 What does the term *carbon neutral* refer to?

- (A) The total fuel/energy consumption of an organisation or product is equal to zero.
- (B) The net fuel/energy consumption of an organisation or product is equal to zero.
- (C) The net greenhouse gas emissions of an organisation or product are equal to zero.
- (D) The total greenhouse gas emissions of an organisation or product are equal to zero.

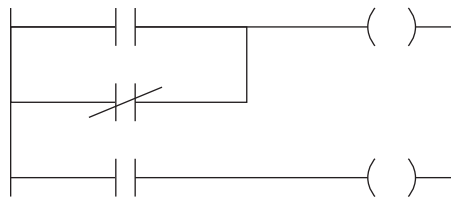
- 7 Which of the following devices is most likely to use a thermocouple?
- (A) A piezo ignition
 - (B) A pressure gauge
 - (C) A cigarette lighter
 - (D) A temperature gauge
- 8 The resistance of a conductor is NOT affected by
- (A) length.
 - (B) permittivity.
 - (C) temperature.
 - (D) cross-sectional area.
- 9 The top of an extension ladder rests against a wall at a vertical height of 8 m. How many metres should the foot of the ladder be from the base of the wall?
- (A) 2.0 m
 - (B) 2.5 m
 - (C) 3.0 m
 - (D) 3.5 m
- 10 Which of the following is the architectural symbol used for a twin fluorescent light fitting?



11 Which material is NOT commonly used as a conductor?

- (A) Aluminium
- (B) Carbon
- (C) Gold
- (D) Silicon

12 What type of diagram is shown?



- (A) Block
- (B) Circuit
- (C) Ladder
- (D) Wiring

13 What units are used for measuring the supply of commercial electrical energy?

- (A) kA
- (B) kV
- (C) kW
- (D) kWh

14 What happens to the resistance of an electrolyte when it is heated?

- (A) It increases.
- (B) It decreases.
- (C) It falls to zero.
- (D) It remains the same.

- 15** What is the minimum time required to fully charge a $470\ \mu\text{F}$ capacitor in series with a $2.1\ \text{k}\Omega$ resistor?
- (A) 0.5 seconds
 - (B) 1 second
 - (C) 2.5 seconds
 - (D) 5 seconds

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Electrotechnology

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Centre Number

Section II

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Student Number

35 marks

Attempt Questions 16–21

Allow about 50 minutes for this section

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Question 16 (2 marks)

What personal protective equipment (PPE) should be worn when working outdoors on a construction site? **2**

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Question 17 (4 marks)

Outline the correct procedure for isolating a power or lighting circuit at the switchboard of a domestic dwelling. **4**

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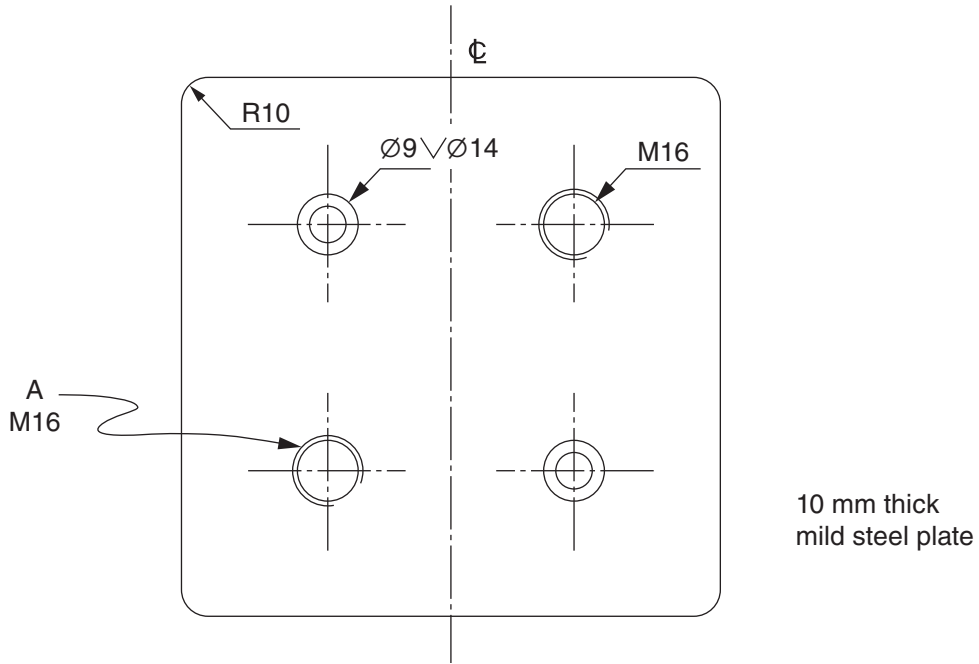
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Question 18 (6 marks)

Refer to the mechanical drawing to answer parts (a) and (b).



- (a) Complete the table by providing the definition for each symbol. 2

<i>Symbol</i>	<i>Definition</i>
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- (b) Outline a process to produce feature A. 4

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Centre Number

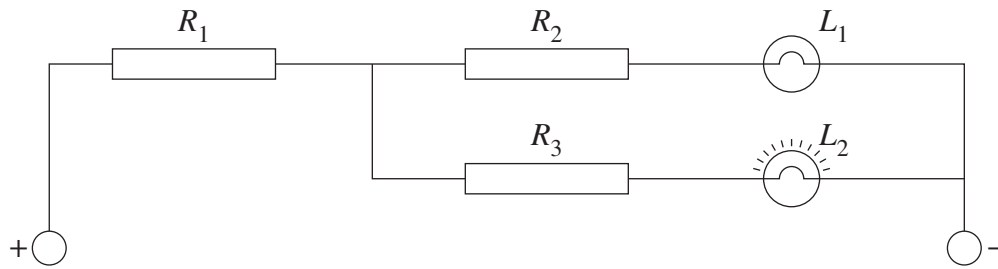
Section II (continued)

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Student Number

Question 19 (6 marks)

The diagram shows L_1 non-functional and L_2 illuminated.



Suggest TWO possible faults and describe a method to test for each fault condition.

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<i>Fault</i>	<i>Testing Method</i>
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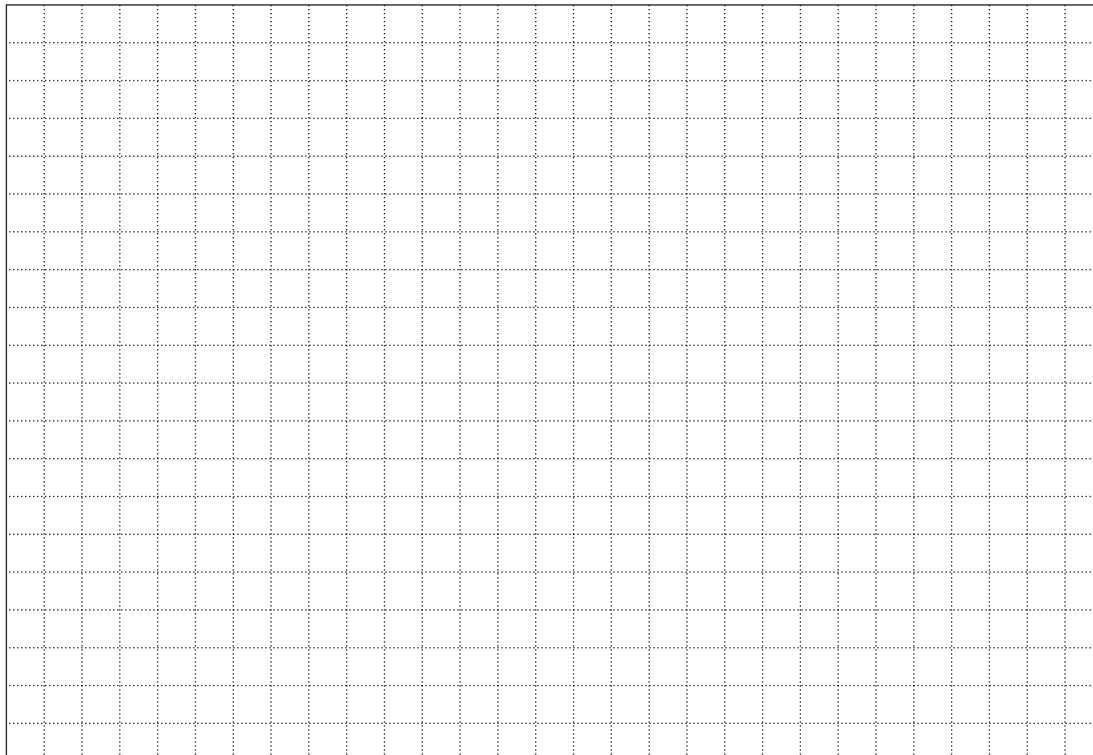
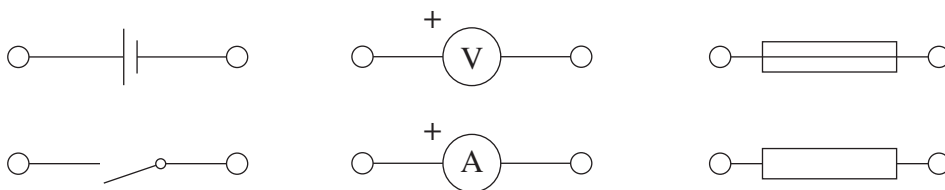
Question 20 (5 marks)

Use the symbols provided to construct a diagram that shows the following:

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- resistor 1 (R_1) in parallel with R_2
- R_3 in series with the R_1, R_2 parallel combination
- R_2 controlled by a switch
- voltage measured for R_3
- current measured for R_1
- circuit supplied by a battery and protected by a fuse.

The symbols may be used more than once.



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Centre Number

Section II (continued)

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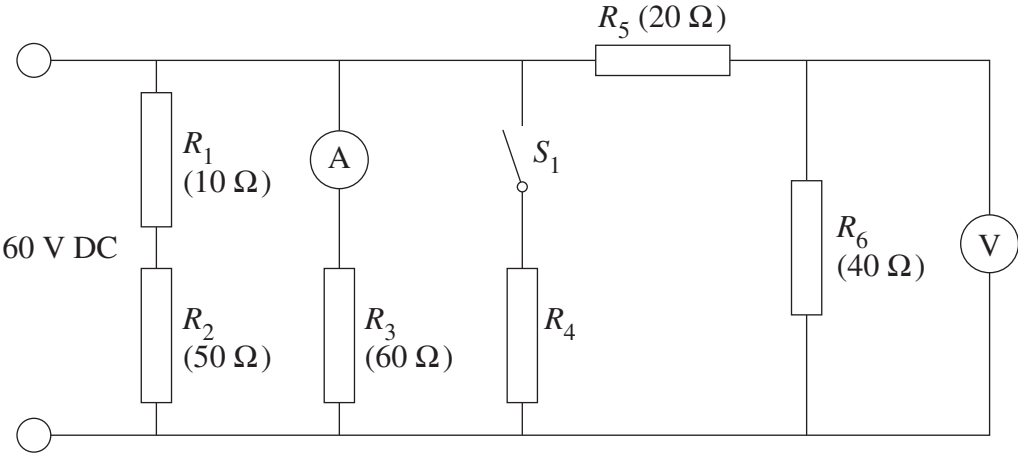
Student Number

Question 21 (12 marks)

Please turn over

Question 21 (12 marks)

Use the diagram to answer parts (a)–(e). Show all working.



- (a) Calculate the total resistance with S_1 open. 2

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- (b) Calculate the current through resistor R_3 . 2

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- (c) Calculate the voltage across R_6 . 2

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Question 21 continues on page 15

Question 21 (continued)

(d) If the total circuit current is 4 A when S_1 is closed, calculate the resistance of R_4 . **3**

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(e) Calculate the power dissipated by resistor R_2 . **3**

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End of Question 21

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Electrotechnology

Section III

15 marks

Attempt Question 22

Allow about 25 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are available.

Your answer will be assessed on how well you:

- demonstrate knowledge and understanding relevant to the question
 - communicate ideas and information using relevant workplace examples and industry terminology
 - present a logical and cohesive response
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Question 22 (15 marks)

Explain how energy efficiency can be achieved in the design and construction of new houses through the selection of appropriate materials, fittings and appliances.

Please turn over

Section IV

15 marks

Attempt Question 23

Allow about 25 minutes for this section

Answer this question in TWO SEPARATE writing booklets. Use one writing booklet to answer part (a) of the question. Use the other writing booklet to answer part (b) of the question. Extra writing booklets are available.

Question 23 (15 marks)


A new single level brick veneer dwelling on a concrete slab is to be constructed.

Answer part (a) of the question in a SEPARATE writing booklet.

- (a) Outline the sequencing with other trades to coordinate the electrical installations for the construction of the new dwelling. **5**

Answer part (b) of the question in a SEPARATE writing booklet.

Use the following extract from a document published by WorkCover NSW to answer part (b).



Safe work method statements

A safe work method statement (SWMS) must be prepared for all high risk construction work.

The document must:

- list the types of high risk construction work being done
- state the health and safety hazards and risks arising from the work to be carried out
- describe how the risks will be controlled
- describe how the risk control measures will be implemented, monitored and reviewed
- take into consideration factors that may affect the way in which the high risk work is carried out
- be readily accessible and easy to read.

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- (b) Develop a safe work method statement (SWMS) for ONE task that an electrician would carry out during the construction of the new dwelling. **10**

End of paper