BOARD OF STUDIES
NEW SOUTH WALES

2012

HIGHER SCHOOL CERTIFICATE EXAMINATION

Electrotechnology

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
  Black pen is preferred
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of pages 9, 11, 13 and 17

Total marks – 80

Section I Pages 2–5

15 marks

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

Section II Pages 9–18

35 marks

- Attempt Questions 16–20
- Allow about 50 minutes for this section

Section III Page 19

15 marks

- Attempt Question 21
- Allow about 25 minutes for this section

Section IV Page 20

15 marks

- Attempt Question 22
- 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.

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1 What type of tap would be used to finish tapping a blind hole in mild steel?

(A) Plug

(B) Taper

(C) Helical

(D) Intermediate

2 Which type of fire extinguisher is recommended for use on a flammable gas fire?

(A) Foam

(B) Carbon dioxide

(C) Air pressurised water

(D) Dry chemical powder

3 Which meter is used when testing the continuity of a heating element?

(A) Ammeter

(B) Voltmeter

(C) Ohmmeter

(D) Watthour meter

4 In the electrical industry, to what does the term *supply* relate?

(A) Electrical metering

(B) Electricity availability

(C) An electrical wholesaler

(D) Electrical Energy Authority

5 An extension ladder is erected 6 metres up a wall.

What is the recommended distance between the foot of the ladder and the wall?

(A) 1.0 m

(B) 1.5 m

(C) 2.0 m

(D) 2.5 m

6 When dismantling an electrotechnology apparatus, what type of punch should be used to help to ensure correct and efficient reassembly?

(A) Centre

(B) Nail

(C) Pin

(D) Wad

7 What will be the effect on the current flow if a circuit connection changes to high resistance?

(A) The current flow will cease.

(B) The current flow will increase.

(C) The current flow will decrease.

(D) The current flow will remain constant.

8 Which type of safety document does NOT have to be monitored or reported on in the workplace?

(A) Safety inspection reports

(B) Accident and incident reports

(C) WorkCover NSW notifications

(D) Purchase orders for safety equipment

9 A site plan is drawn to a scale of 1 : 200.

What length is a line on the plan that represents 31 metres?

(A) 15.5 mm

(B) 155 mm

(C) 200 mm

(D) 310 mm

10 Which of the following is a chemical hazard when drilling masonry?

(A) Dust

(B) Noise

(C) Radiation

(D) Vibration

11 Which of the following indicates the losses of an electrical machine?

(A) Power minus work

(B) Work minus power

(C) Input minus output

(D) Output minus input

12 What is the SI unit of energy?

(A) Watt

(B) Joule

(C) Newton

(D) Newton-metre

13 Three capacitors are connected in series and charged.

What is the charge of each capacitor?

(A) Equal to the total charge

(B) Three times the total charge

(C) One-third of the total charge

(D) Nine times the total charge

14 What is 2.4 μA equal to?

(A) 0.0024 A

(B) 0.00024 A

(C) 0.0024 mA

(D) 0.00024 mA

15 Twenty-five resistors each with a value of 1 kΩ are connected in parallel with each other.

What will be the equivalent resistance of this combination?

(A) 40 Ω

(B) 250 Ω

(C) 1 kΩ

(D) 25 kΩ

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2012 HIGHER SCHOOL CERTIFICATE EXAMINATION

Electrotechnology

Centre Number

Section II

Student Number

35 marks
Attempt Questions 16–20
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 (8 marks)

(a) List THREE items of personal protective equipment needed when using a portable electrical power tool to drill into concrete. **3**

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(b) Outline reasons why a portable electrical power tool might be deemed unsafe. **5**

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Question 17 (6 marks)

A worker finds a colleague lying on a wet factory floor. He suspects that the colleague has received an electric shock. Explain the actions the worker should take. **6**

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Centre Number

Student Number

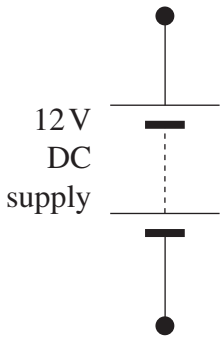
Section II (continued)

Question 18 (7 marks)

Using standard symbols, design and label a working circuit from the following description. **7**

The circuit must connect to the 12 V supply shown and have

- a circuit protection device
- a switch (S1) to operate lamp 1 and lamp 2 (L1 and L2) which are connected in parallel
- a voltmeter connected to show voltage across lamp 2 (L2), including correct polarity
- an ammeter connected to show current flow through lamp 1 (L1), including correct polarity.



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Centre Number

Student Number

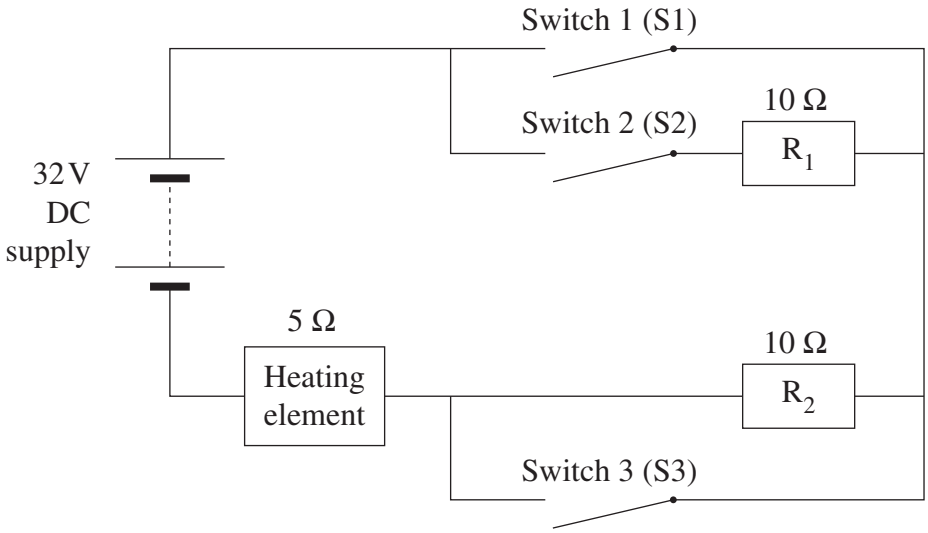
Section II (continued)

Question 19 (8 marks)

Please turn over

Question 19 (8 marks)

A circuit diagram is shown.



(a) Place a cross (X) in the appropriate box to indicate the state of the switches for the heating element to produce high, medium and low heat.

(i) High heat **1**

	S1	S2	S3
Open			
Closed			

(ii) Medium heat **1**

	S1	S2	S3
Open			
Closed			

(iii) Low heat **1**

	S1	S2	S3
Open			
Closed			

Question 19 continues on page 15

(b) Calculate the current of the circuit when S1 is open, S2 is closed and S3 is open. **2**

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(c) Calculate the power dissipation of the heating element when S1 is closed, S2 is open and S3 is open. **3**

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End of Question 19

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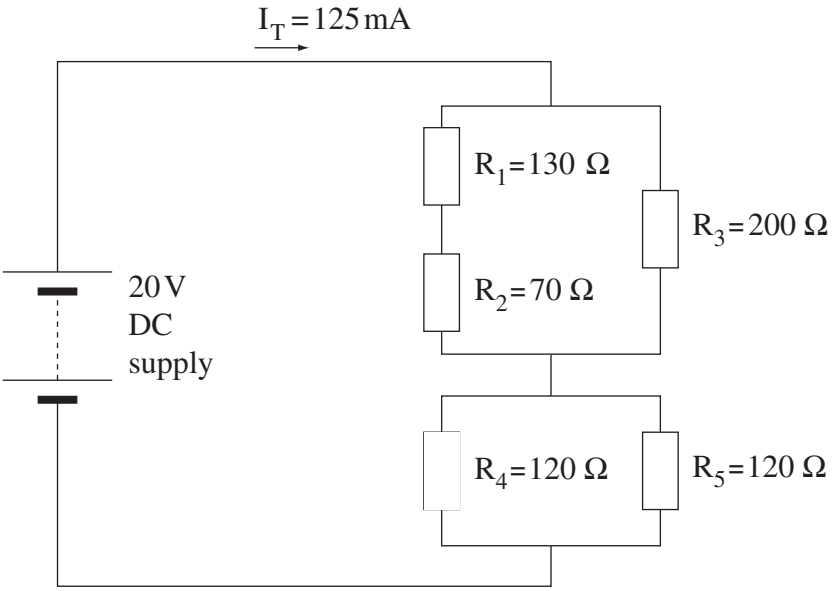
Question 20 (6 marks)

Please turn over

Question 20 (6 marks)

A circuit diagram is shown.



(a) Calculate the equivalent resistance of R_4 and R_5. **1**

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(b) Calculate the equivalent resistance of R_1, R_2 and R_3. **2**

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(c) Calculate the voltage drop across R_5. **1**

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(d) If R_1 becomes open circuit, what will be the effect on:

(i) The circuit resistance **1**

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(ii) The circuit current..... **1**

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Electrotechnology

Section III

15 marks
Attempt Question 21
Allow about 25 minutes for this section

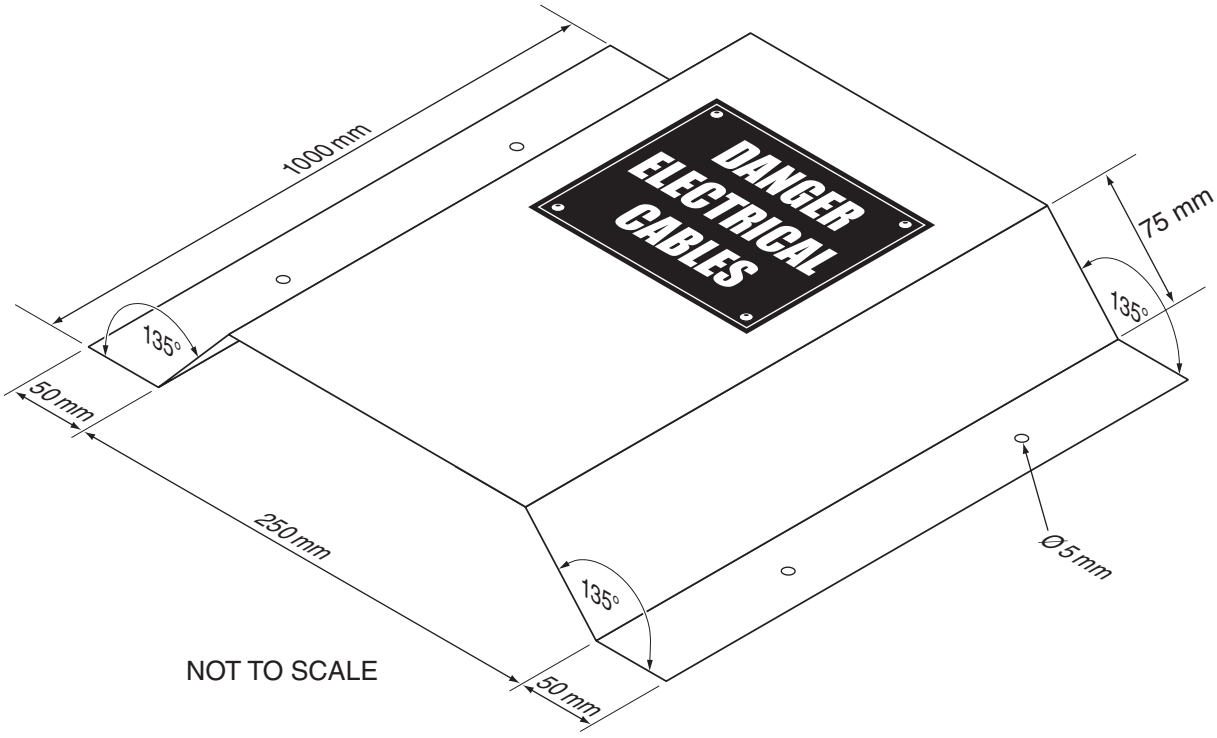
Answer the question in a writing booklet. Extra writing booklets are available.

In your answer you 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

Question 21 (15 marks)

The cabling cover shown is to be manufactured in the workshop from 0.9 mm galvanised sheet metal. A supplied warning plate must be riveted to the outside before installation.



Describe the tools, equipment, processes and WHS (OHS) requirements to manufacture this cover with the warning plate.

Please turn over

Section IV

15 marks
Attempt Question 22
Allow about 25 minutes for this section

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

Question 22 (15 marks)

Rob is on a work placement where the team leader continually provides insufficient time to complete tasks and says to cut corners wherever possible. The team leader has sent Rob inappropriate text messages and emails, and has told Rob to '… harden up, you need to be tougher than that to work in this company'.

(a) What actions should Rob take to address these practices? **3**

(b) Identify where the team leader has neglected their duty of care. **3**

The team leader instructs Rob to repair an illuminated shop sign located on the top of a shop awning. Rob has an aluminium extension ladder and some tools. The team leader tells Rob he will be back in half an hour to pick him up. Rob is left alone to complete the task.

(c) Analyse the safety issues involved with this task. **9**

End of paper