BOARD OF STUDIES
NEW SOUTH WALES

2011

HIGHER SCHOOL CERTIFICATE EXAMINATION

Electrotechnology

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black pen 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 5, 7, 9 and 11

Total marks – 80

Section I Pages 2–4

15 marks

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

Section II Pages 5–12

35 marks

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

Section III Page 13

15 marks

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

Section IV Page 14

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 When measuring the current in a load, how should the load be connected?

(A) In parallel with an ammeter

(B) In parallel with a voltmeter

(C) In series with an ammeter

(D) In series with a voltmeter

2 What is the standard with which electrical wiring must comply?

(A) AS/NZS 2000

(B) AS/NZS 3000

(C) AS/NZS 4000

(D) AS/NZS 5000

3 What is the correct hacksaw blade to use when cutting steel conduit with a wall thickness of 1 mm?

(A) 14 TPI

(B) 18 TPI

(C) 24 TPI

(D) 32 TPI

4 Which file would remove the most material in a single stroke?

(A) Bastard file

(B) Second cut file

(C) Smooth file

(D) Warding file

5 Current in a solid conductor is a result of movement of

(A) electron orbits.

(B) free electrons.

(C) negative ions.

(D) the conductor.

6 What is electromotive force?

(A) Power in an electrical circuit

(B) A movement of electrons

(C) Electrical pressure

(D) Electrical energy

7 When using a M12 × 1.5 tap, what size hole should be drilled?

(A) 9.5 mm

(B) 10.5 mm

(C) 11.5 mm

(D) 12 mm

8 What is always present when current flows in a conductor?

(A) Heat and chemicals

(B) Light and movement

(C) Light and magnetism

(D) Heat and magnetic field

9 What is the name for a solution capable of conducting an electric current?

(A) An electrolyte

(B) An electrostat

(C) An electrolysis

(D) A hydroelectric

10 What determines the quantity of electrical energy produced by a photo voltaic cell?

(A) The size of the electrodes

(B) The material makeup of the electrodes

(C) The number of positive and negative cells

(D) The intensity of radiation to which the cells are exposed

11 A 47k ohm resistor has a tolerance of 2%.

In what range will the resistance be?

(A) 45k – 49k ohms

(B) 4606 – 4794 ohms

(C) 46 060 – 47 940 ohms

(D) 40 000 – 50 000 ohms

12 What voltage should be selected on an insulation resistance tester to test circuit wiring?

(A) 20

(B) 40

(C) 100

(D) 500

13 What is the most likely cause of a Residual Current Device (RCD) interrupting supply?

(A) Excess current

(B) Voltage too low

(C) Current leakage to earth

(D) Open circuit in appliance

14 What is the equivalent resistance of a parallel combination of resistors?

(A) Equal to the highest value resistor

(B) Less than the lowest value resistor

(C) Equal to the lowest value resistor

(D) Greater than the highest value resistor

15 What is the terminal voltage of four 1.5 volt cells connected in parallel?

(A) 1.5 volts

(B) 3.0 volts

(C) 4.5 volts

(D) 6.0 volts

2011 HIGHER SCHOOL CERTIFICATE EXAMINATION

Electrotechnology

Centre Number

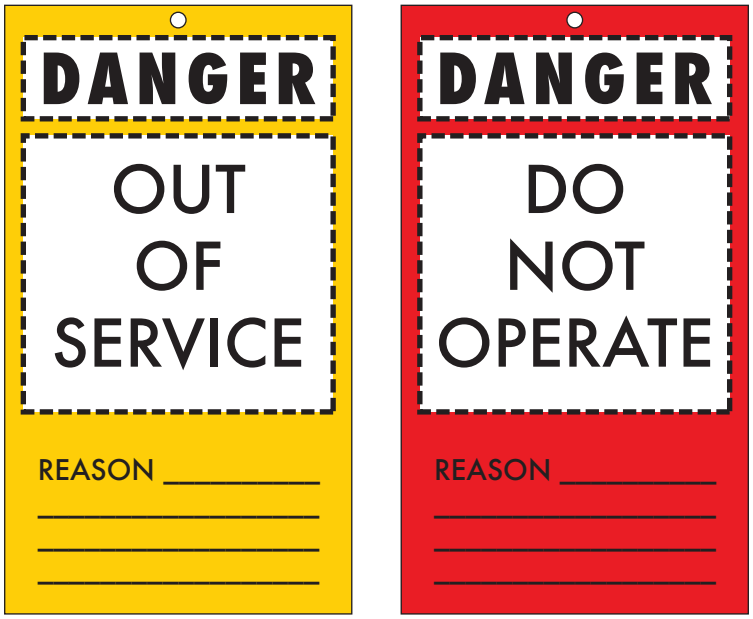
Student Number

Section II

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 (7 marks)



(a) Identify the purpose of the yellow OUT OF SERVICE tag and the red DO NOT OPERATE tag, and provide an example of where each tag is used. **4**

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Question 16 continues on page 6

Question 16 (continued)

(b) Name TWO people authorised to remove a red DO NOT OPERATE tag, and outline the procedure for its removal. **3**

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End of Question 16

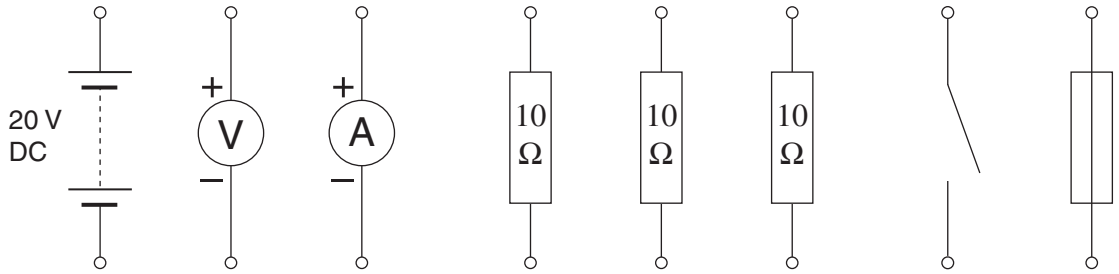
Centre Number

Student Number

Section II (continued)

Question 17 (7 marks)

An incomplete circuit diagram is shown.



(a) Complete the circuit above by drawing the wiring to connect the: **5**

- resistors in series
- voltmeter to measure the supply voltage
- ammeter to measure the total circuit current
- switch for circuit control
- fuse for circuit protection.

(b) If the switch in the above circuit is closed, what would be the value shown on the ammeter? Show all working. **2**

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Question 18 (7 marks)

Three types of communication are listed below.

Give examples that show how each would be used on a worksite.

(a) Verbal: **2**

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(b) Non-verbal: **2**

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(c) Written: **3**

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Electrotechnology

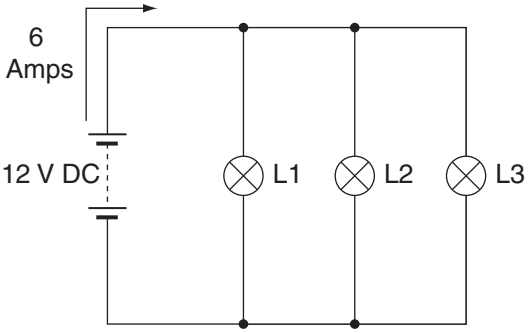
Centre Number

Student Number

Section II (continued)

Question 19 (5 marks)

The diagram shows three identical lamps.



Show all working for each part of this question.

(a) What is the current for each branch of the circuit? **1**

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(b) What is the power dissipated by each individual lamp? **2**

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(c) What is the total power dissipated in the circuit by the three lamps? **2**

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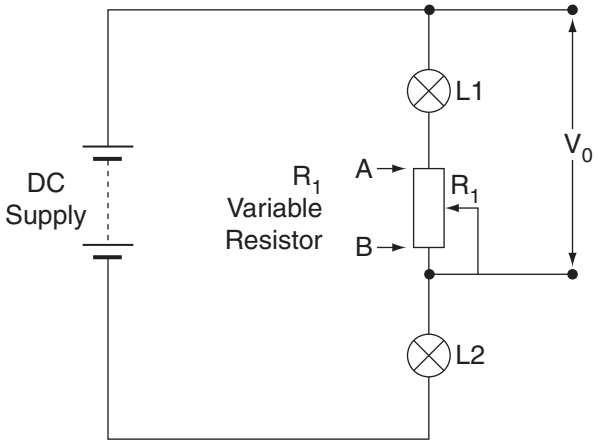
Centre Number

Student Number

Section II (continued)

Question 20 (9 marks)

A circuit is shown.



(a) (i) Describe what happens to the lamps when the variable resistor (R_1) is at point A and at point B. **2**

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(ii) What will the voltage be at the terminals of lamp 1 (L1), if it becomes open circuit? **1**

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(iii) What will the total current in the circuit be if lamp 1 (L1) becomes open circuit? **1**

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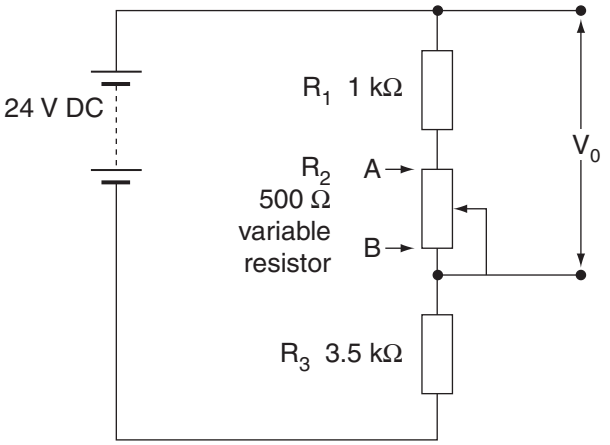
Question 20 continues on page 12

Question 20 (continued)

A circuit is shown.



(b) Calculate the voltage at terminals V_0 when the variable resistor is at point B. (Variable resistor is set at 500 ohms.) Show all working. **5**

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End of Question 20

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)

Materials have been delivered by truck outside a building site and need to be unloaded. The delivery consists of:

- several electrical power tools
- a bundle of 20 4-metre lengths of conduit
- a 250 mL container of conduit adhesive
- a 300-metre roll of 16 mm^2 cable.

Explain the procedures involved in the correct manual handling and appropriate site storage of these materials. In your response, refer to OHS requirements.

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)

Your employer has directed you to clean an exhaust fan in a local restaurant food preparation area. The exhaust fan has become clogged with dust and grease.

(a) You need to get cleaning solvent from the chemical storage area of your employer's workshop. **6**

Identify the handling and storage procedures that need to be followed. In your response refer to OHS requirements.

(b) Provide a detailed explanation of the process that should be used when undertaking this cleaning task. In your response, refer to customer service, isolation procedures and safe working methods. **9**

End of paper