



B O A R D O F S T U D I E S
NEW SOUTH WALES

2011

**HIGHER SCHOOL CERTIFICATE
EXAMINATION**

Industrial Technology

Electronics Technologies

General Instructions

- Reading time – 5 minutes
- Working time – $1\frac{1}{2}$ hours
- Write using black or blue pen
Black pen is preferred
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of page 9

Total marks – 40

Section I Pages 2–6

10 marks

- Attempt Questions 1–10
- Allow about 20 minutes for this section

Section II Pages 9–12

15 marks

- Attempt Questions 11–16
- Allow about 35 minutes for this section

Section III Page 13

15 marks

- Attempt Question 17
- Allow about 35 minutes for this section

Section I

10 marks

Attempt Questions 1–10

Allow about 20 minutes for this section

Use the multiple-choice answer sheet for Questions 1–10.

1 When a switch is closed, the resistance is approximately

- (A) 0 Ω .
- (B) 0.5 Ω .
- (C) 0.75 Ω .
- (D) 1 Ω .

2 Passive electronic components cannot increase the strength of a signal by themselves.

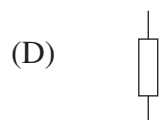
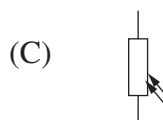
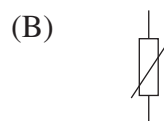
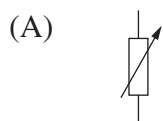
Which of the following is an example of a passive electronic component?

- (A) A relay
- (B) A transistor
- (C) An inductor
- (D) An integrated circuit

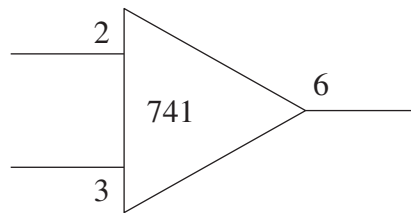
3 If the output of a NOT gate is high, which of the following is true?

- (A) The single input is low.
- (B) The single input is high.
- (C) One of the two inputs is low.
- (D) Both of the two inputs are high.

4 Which of the symbols shown below represents a thermistor?

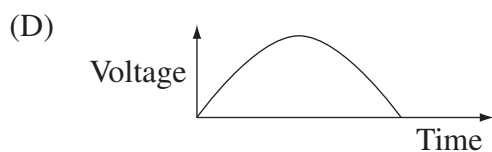
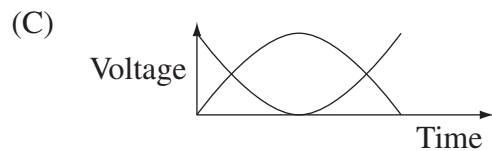
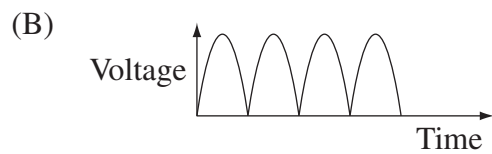
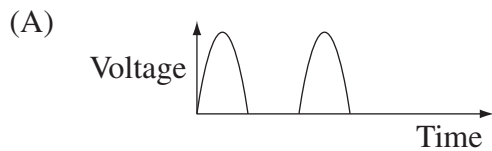


- 5 Which of the following best describes the piezoelectric effect?
- (A) Capacitance developed across a straight crystal
 - (B) Potential difference developed across a straight crystal
 - (C) Capacitance developed across the opposite faces of a bent crystal
 - (D) Potential difference developed across the opposite faces of a bent crystal
- 6 The circuit symbol for a 741 op amp is shown.



What do the numbers 2, 3 and 6 indicate?

- (A) Connecting pin identification numbers
 - (B) Minimum current in mA permitted at these points
 - (C) Maximum current in mA permitted at these points
 - (D) Maximum number of components that can be connected at these points
- 7 Which graph best represents full-wave rectification?

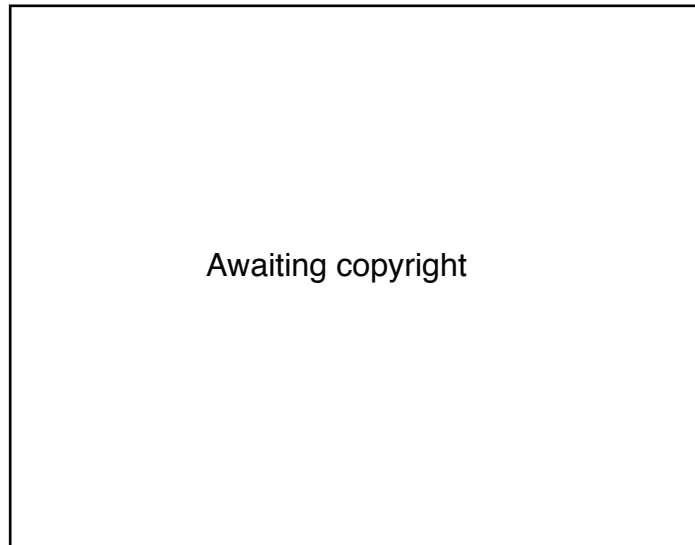


- 8 A hot water system rated at 8 kW takes 4 hours to heat a full tank of water. Electric power is charged at 10 cents per kWh.

How much does it cost to heat a full tank of water?

- (A) \$0.20
 - (B) \$0.40
 - (C) \$1.60
 - (D) \$3.20
- 9 Which of the following is the correct method of testing if an electrolytic capacitor is short-circuiting?
- (A) Potential difference is checked by connecting the positive lead of the multimeter to the negative terminal of the capacitor.
 - (B) Potential difference is checked by connecting the negative lead of the multimeter to the negative terminal of the capacitor.
 - (C) Resistance is checked by connecting the positive lead of the multimeter to the negative terminal of the capacitor.
 - (D) Resistance is checked by connecting the negative lead of the multimeter to the negative terminal of the capacitor.

- 10 The circuit diagram for a twin-LED flasher is shown.



The table shows the price of individual components.

<i>Component</i>	<i>Quantity of individual components</i>	<i>Price</i>
10 μF electrolytic capacitor	1–9	\$0.36 each
	10–24	\$0.25 each
	25+	\$0.21 each
LED	1–9	\$0.20 each
	10–24	\$0.18 each
	25+	\$0.14 each
47 $\text{k}\Omega$ resistor	1–49	\$0.06 each
	50–99	\$0.05 each
	100+	\$0.04 each
470 Ω resistor	1–49	\$0.06 each
	50–99	\$0.05 each
	100+	\$0.04 each
BC548 transistor	1–9	\$0.26 each
	10–24	\$0.23 each
	25+	\$0.18 each

What is the cost of purchasing the electronic components to build 25 twin-LED flasher circuits?

- (A) \$1.88
- (B) \$21.00
- (C) \$31.50
- (D) \$47.00

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Industrial Technology Electronics Technologies

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Centre Number

Section II

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Student Number

15 marks

Attempt Questions 11–16

Allow about 35 minutes for this section

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

Question 11 (1 mark)

How can diodes be damaged in a working electronic circuit?

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Question 12 (2 marks)

Why are more light emitting diodes (LEDs) than filament globes being used in the electronics industry?

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Question 13 (2 marks)

What general operating properties should be considered when selecting a loudspeaker?

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Question 14 (3 marks)

Describe the relationship between the primary and secondary coils of a transformer. You may wish to use the diagram of a transformer to support your answer.

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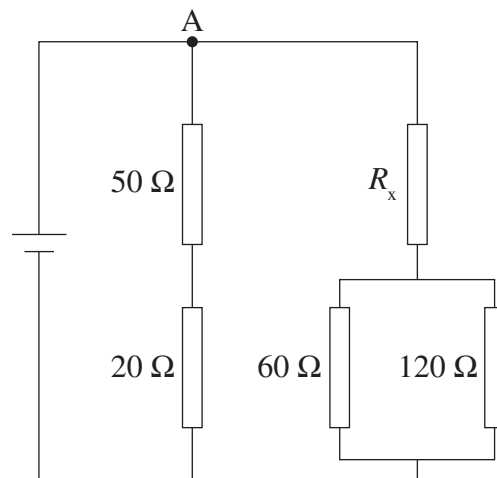
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Question 15 (3 marks)

The mainline current divides evenly at the point A in the circuit shown.

3



$$R_T = R_1 + R_2 + R_3 \dots$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \dots$$

$$V = IR$$

$$P = VI$$

Use the formulae provided to determine the value of resistor R_x .

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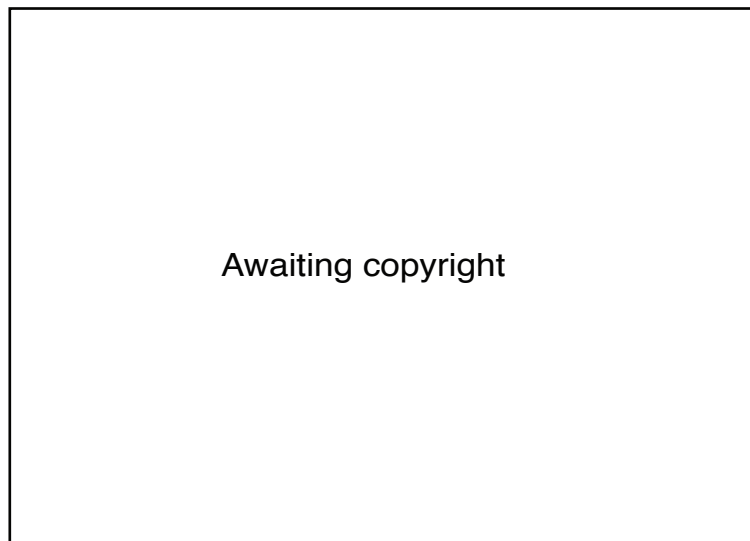
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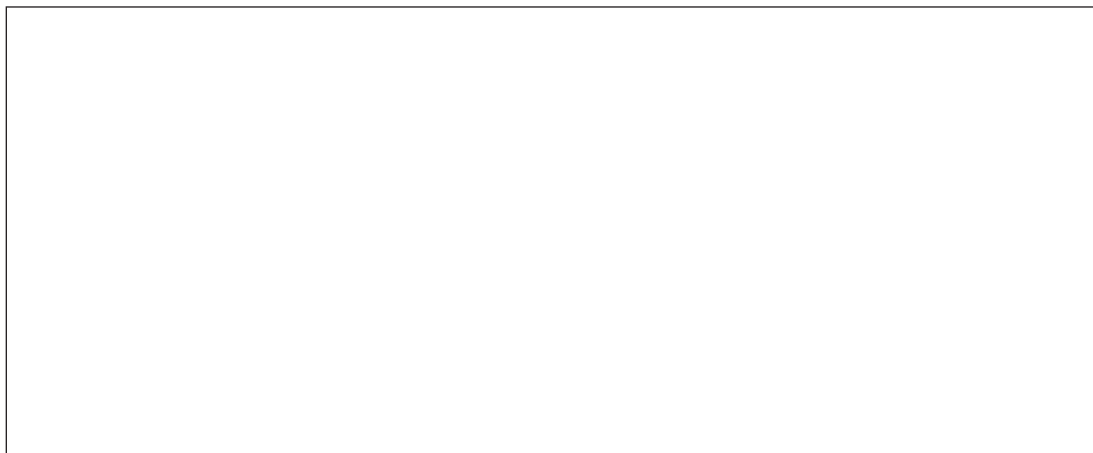
Question 16 (4 marks)

A light switch circuit is shown.

4



Design and justify a printed circuit board track layout for this circuit.



**Industrial Technology
Electronics Technologies**

Section III

15 marks

Attempt Question 17

Allow about 35 minutes for this section

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

Question 17 (15 marks)

A company is expanding its operations by establishing an interstate facility.

- (a) Describe personnel issues the company needs to consider when staffing the new facility. **5**
- (b) Analyse factors, other than personnel issues, that could affect the viability of the company at the new location. **10**

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