

ESTA 1012- Electrical Service Technician “A” Answer Schedule

- Notes:
1. (1 mark) means that the preceding statement/answer earns 1 mark.
 2. This schedule sets out the expected answers to the examination questions. The marker can exercise their discretion and decide on the overall accuracy of any answer that is presented in the candidate's own words.
 3. Symbols and terms - alternatives
Power W or P
Voltage V or E or U
Phase Active
 4. Key to abbreviated terms:
EA Electricity Act 1992
ER Electricity Regulations 1997
AS/NZS Australia and New Zealand Joint Standard
NZS New Zealand Standard
AS Australian Standard
ECP New Zealand Electrical Code of Practice
GK General Knowledge

Section One

Each part in this section is worth 5 marks.

Question 1

AS/NZS 3760

multi-choice answer – (d)

Question 2

Doubled

multi-choice answer – (b)

Question 3

One element only across the supply

multi-choice answer –(b)

Question 4

\$2.76

multi-choice answer – (c)

Question 5

Just up to the terminals

multi-choice answer – (a)

Question 6

373 watts

multi-choice answer – (a)

Question 7

(e) Two elements in series

multi-choice answer – (a)

Question 8

Highest heating effect

multi-choice answer – (c)

Question 9

(i) A sustained overload

multi-choice answer – (a)

Question 10

20A

multi-choice answer – (b)

Question 11

(a) Value 1

$$R = \frac{V}{I}$$

$$= \frac{230}{10}$$

$$= 23 \Omega$$

(1/2 mark)

(1/2 mark)

(1 mark)

(b) Value 2

$$I = \frac{V}{R}$$

$$= \frac{200}{40}$$

$$= 5 \text{ A}$$

(1/2 mark)

(1/2 mark)

(1 mark)

(c) A voltmeter
or
A multimeter set on the voltage scale

(1 mark)

Question 12

(a) Value 3

$$W = \frac{V^2}{R}$$

(1/2 mark)

$$= \frac{200 \times 200}{40}$$

(1/2 mark)

$$= 1000 \text{ W}$$

(1 mark)

(b) Value 4

$$V = I \times R$$

(1/2 mark)

$$= 46 \times 5$$

(1/2 mark)

$$= 230 \text{ V}$$

(1 mark)

(c) An ammeter
or

A multimeter set on the amps scale

(1 mark)

Question 13

- (a) Voltage is dropped as the load current passes through the conductor resistance (1 mark)
- (b) • Use a flexible cord with an increased cross-sectional area (1 mark)
- Reduce the length of the cord (1 mark)
- (d) It is the maximum current that a flexible cord is designed to carry safely without overheating (2 marks)

Question 14

(a) Any ONE of:

- The load current is likely to arc across the micro gap as the switch contacts are opened and damage them.
- It is easier to extinguish an a.c. arc as the current goes through zero in each half-cycle.

(2 marks)

(b) Any TWO of:

- No guarantee of polarity
- No earthing facility
- Insufficient current rating

(2 marks)

(c) Any ONE of:

- By minimising the risk of contact with the active (phase) conductor when changing a lamp with the power supply, energised
- By minimising the risk of contact with the active (phase) conductor when the lamp is removed and the terminals are exposed

(1 mark)

Question 15

(a) Any ONE of the following methods:

Method 1

- Disconnect the protective earthing conductor from the appliance and test (1/2 mark)
- If the resistance of protective earthing conductor is more than 1 Ω , replace the flexible cord. (1 mark)
- If the resistance of protective earthing conductor is less than 1 Ω , re-terminate protective earthing conductor, ensuring that the termination is sound and clean. (1 mark)
- Re-test the protective earthing conductor to ensure resistance is 1 Ω , or less (1/2 mark)

Method 2

- Ensure all earth terminations and connections are tight and properly installed and/or, (1 mark)
- Replace supply lead and plug, (1 1/2 marks)
- In order to get a result of 1 Ω or less. (1/2 mark)

Method 3

- Clip one terminal of ohm-meter to the plug earth pin and test between this reference and points along the earth circuit to identify the high resistance. (1 mark)
 - Repair faulty terminations or replace faulty cord. (1 1/2 marks)
 - Retest between plug earth and appliance frame to ensure <1.0 Ω . (1/2 mark)
- (b)
- Increased danger of flashover or tracking due to moisture inside the appliance.
 - Under fault conditions, decreased resistance to earth increases the risk of shock hazard. (2 marks)

Question 16

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad (1/2 \text{ mark})$$

$$= \frac{1}{30} + \frac{1}{60} + \frac{1}{12} \quad (1/2 \text{ mark})$$

$$= \frac{8}{60} \quad (1/2 \text{ mark})$$

$$R_t = \frac{60}{8} \quad (1/2 \text{ mark})$$

$$= 7.5 \Omega \quad (1 \text{ mark})$$

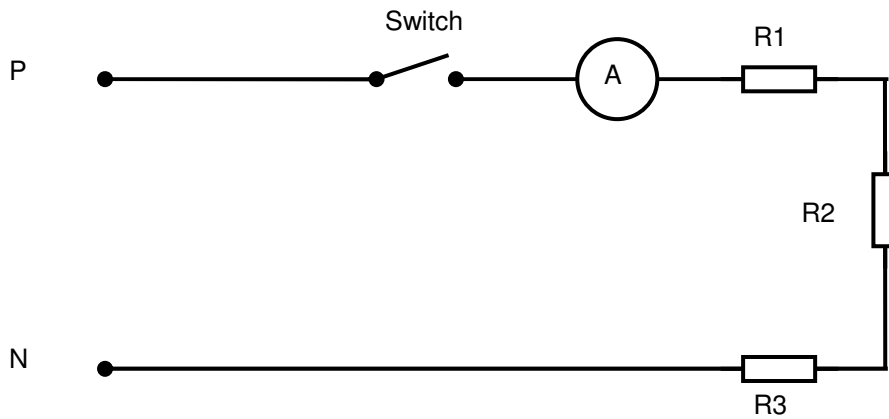
$$W = \frac{V^2}{R} \quad (1/2 \text{ mark})$$

$$= \frac{230 \times 230}{7.5} \quad (1/2 \text{ mark})$$

$$= 7053.33 \text{ W or } 7.05 \text{ kW} \quad (1 \text{ mark})$$

Question 17

(a)



- Correct polarity (1/2 mark)
 - Correctly connected switch (1/2 mark)
 - Correctly connected ammeter (1/2 mark)
 - Correctly connected resistors. (1/2 mark)
- (Total 2 marks)

(b) $R_t = 150 + 100 + 70$ (1/2 mark)

$= 320\Omega$ (1/2 mark)

$V = I \times R$ (1/2 mark)

$= 0.72 \times 320$ (1/2 mark)

$= 230.4 \text{ V}$ (1 mark)

Question 18

- (a) A protective earthing conductor resistance test. (1 mark)
- (b)
 - Bridge out phase and neutral on the plug.
 - Test between phase/neutral and earth on the plug. (2 marks)
- (c) (i) An insulation resistance tester. (1 mark)
- (ii) 500 V d.c. (1 mark)

Question 19

(a) Any THREE of:-

- It will safely interrupt short circuit currents of much higher values or higher rupturing capacity.
- It eliminates arcing because the fuse element is sealed.
- It is obtainable in a range of Utilisation category (fusing factors).
- Current rating is clearly marked.
- Reliable operation within prescribed limits.
- Good discrimination.
- Constant fusing characteristics.
- Faster operation/acting.
- Doesn't deteriorate over time.

(3 marks)

(b) Any TWO of:

- If the fuse blows again an arc may be established between the fuse terminals causing damage or injury
- Cannot safely interrupt short circuit currents of much higher values.
- Fuse wire may protrude past the holder which creates an exposure to shock.
- Suitable fixing for the fuse wire is not generally available.
- Fuse holder is not fire proof.
- Slower operation/acting.

(2 marks)

Question 20

- (a)
- Safe working practices appropriate to the type of work being undertaken.
 - Testing to ensure safety prior to commencing the work, and to ensure safety during and after completion of the work.
 - Basic first aid.
 - Cardiopulmonary resuscitation.

(4 marks)
ER 26(2)

- (b) At intervals not exceeding 24 months.

ER 26(3)
(1 mark)