

ESTA 1032 - Electrical Service Technician "A" Answer Schedule

- Notes:
- (1 mark) means that the preceding statement/answer earns 1 mark.
 - 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.
 - Symbols and terms - alternatives
Power W or P
Voltage V or E or U
Phase Active
 - 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
 - Where applicable, the parts of an answer underlined are the points that need to be covered.

Question 1

Each part in this question is worth 2 marks.

- (a) A short circuit condition
multi-choice answer – (4)
- (b) Attaching an out-of-service tag to the electrical appliance
multi-choice answer – (1)
- (c) 0.38A
multi-choice answer – (4)
- (d) One element only across the supply
multi-choice answer –(3)
- (e) Contact by any person or animal with live parts
multi-choice answer – (2)
- (f) AS /NZS 3760
multi-choice answer – (1)

(g) 46 cents

multi-choice answer – (2)

(h) 5 metres of 1.0mm² cord

multi-choice answer – (4+)
)

(i) Halved

multi-choice answer – (3)

(j) Water - gas expelled

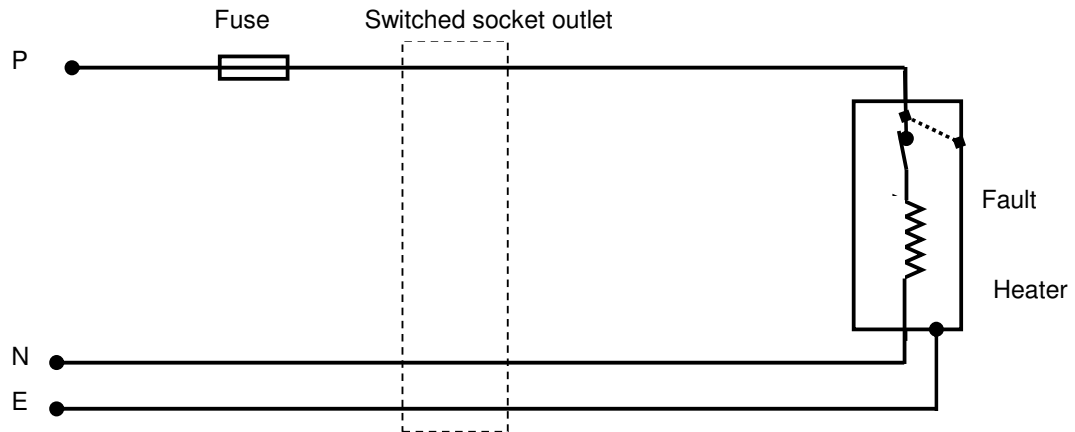
multi-choice answer – (1)

Question 2

- (a) (i) Three (1 marks)
- (ii) • Brown, light blue (or blue) and green/yellow
or
• Red, black, green (3 marks)
- (iii) Two (1 marks)
- (iv) • Brown and light blue (or blue)
or
• Red and black (2 marks)
- (b) (i) Failure will be by melting of sheath and/or insulation deterioration due to heat build-up (1 mark)
- (ii) • Fully unwind the cord from the drum
• Only use the cord to supply a load that has a current rating less than that of the cord (2 marks)

Question 3

(a)



- Correct polarity (1½ marks)
- Heater switch correctly connected (½ mark)
- Correctly connected fuse (1 mark)
- Fault correctly shown (1 mark)

(b) (i) Current flowing $I = \frac{V}{R}$ (½ mark)

$= \frac{230}{11}$ (½ mark)

$= 20.9\text{A fault current}$ (1 mark)

(ii) Fusing current of the fuse is $16 \times 1.5 = 24$ amps. (1 mark)

The fuse will not operate as intended because the fault current is 20.9A. (1 mark)

(iii) $W = V \times I$ (½ mark)

$= 230 \times 20.9$ (½ mark)

$= 4807\text{W}$ (1 mark)

Question 4

(a) (i) Any THREE of:

- Connect phase and neutral together, and test between this linked pair and earth.
- Bridge out the semi-conductor devices before testing.
- Test between phase and earth and neutral and earth.
- Apply a test voltage of 250V d.c

(3 marks)

(ii) (A) An insulation resistance tester.

(1 mark)

(B) 500 V d.c.

(1 mark)

(C) A minimum value of 1 M Ω .

(1 mark)

(D) Test between the phase/neutral and the earth pin of the plug.

(2 marks)

(b) The protective earthing conductor was open circuited (or was of a high resistance) and there was a phase to frame fault on the appliance.

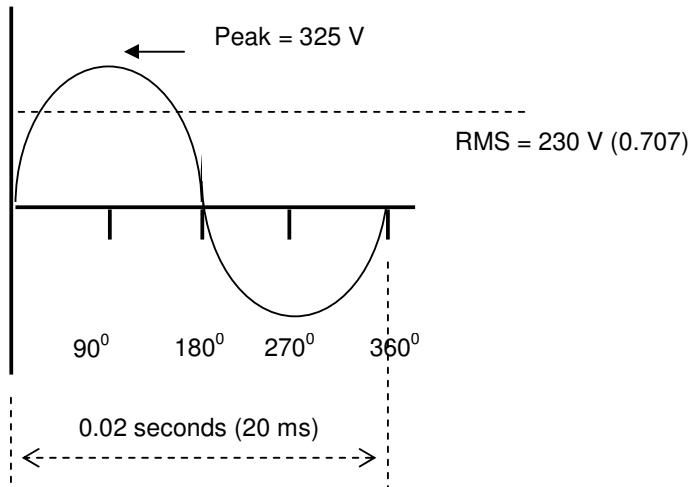
(2 marks)

Question 5

(a) The number of complete changes/cycles per second.

(1 mark)

(b)



- Time interval correctly shown (1 mark)
- Peak voltage correctly shown (1 mark)
- RMS voltage correctly shown (1 mark)
- Axis's symmetrical and the wave the correct shape (1 mark)

(c) (i) Any TWO of:

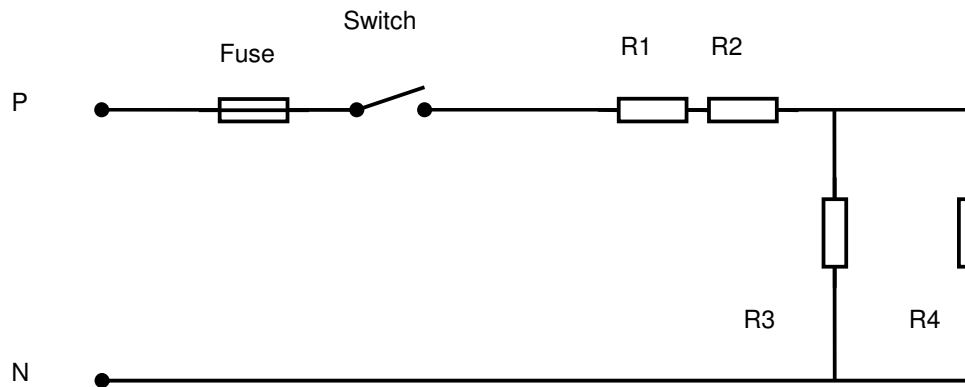
- It maintains the voltage of the frame of the appliance to about 0 volts.
- It provides a low resistance path for the fault current.
- Ensures sufficient fault current can flow to operate the protection. (2 marks)

(ii) The method has to show:

- Testing to detect source of high resistance. (1 mark)
- Repair faulty terminations or replace faulty cord or replacement of faulty plug. (1 mark)
- Re-testing of the protective earthing conductor to ensure resistance is less than 1Ω , (1 mark)

Question 6

(a)



- Correct polarity (1 mark)
 - Correctly connected fuse (1/2 mark)
 - Correctly connected switch (1/2 mark)
 - Correctly connected resistors. (1 mark)
- (Total 3 marks)

(b) (i) $\frac{1}{R_T} = \frac{1}{R_3} + \frac{1}{R_4}$ (1/2 mark)

$\frac{1}{R_p} = \frac{1}{20} + \frac{1}{25}$ (1/2 mark)

$= \frac{9}{100}$ (1/2 mark)

$= 11.11\Omega$ (1/2 mark)

$R_t = 50 + 10 + 11.11$ (1/2 mark)

$= 71.11 \Omega$ (1/2 mark)

$I = \frac{V}{R}$ (1/2 mark)

$= \underline{230}$

71.11

$$= 3.23 \text{ amps}$$

(½ mark)

(1 mark)

$$(ii) \quad W = \frac{V^2}{R}$$

(½ mark)

$$= \frac{230 \times 230}{85}$$

(½ mark)

$$= 622.35W$$

(1 mark)

Question 7

(a) If strain is applied to the flexible cord the PEC will be the last to pull away from the terminals.

(1 mark)

(b) • No provision for the earthing of the drill.

(1 mark)

• Insufficient current carrying capacity

(1 mark)

(c) Any THREE of:

- High electrical resistance or dielectric strength
- Good flexibility
- Non absorbent
- Can withstand mechanical stress
- Can withstand corrosive environments in which it will be used
- Can withstand the temperature range of environment in which it will be used.
- Can withstand heat from the circuit conductors.

(3 marks)

(d) (i) Simmerstat

The bi-metal strip heats up and controls load by switching on and off on a time basis.

(2 marks)

(ii) Thermostat

Opens/closes by the temperature of the environment

(2 marks)

Question 8

(a) (i) A practising licence

EA 95(1)
(1 mark)

(ii) 30 June of the year it is stated to expire.
(also accept 1 July)

Electricity Amendment Act 1997 4(2)(b)
(1 mark)

(iii) The Registrar

EA 96(1) or 100(4)
(1 mark)

(b) Any THREE of:

- Registered electricians
- Registered line mechanics
- Registered electrical inspectors
- Persons who are authorised to carry out such work under a provisional licence
- Trainees
- Qualified engineers

EA 108 (2)
(3 marks)

(c)

- Safe working practices
- Testing
- CPR
- Basic first aid

ER 25
(4 marks)

Question 9

- (a)
- Neutral current out of balance with the phase current. (1 mark)
 - A magnetic field is induced into the iron core. (1 mark)
 - The induced magnetic field induces a current in the sensing coil (1 mark)
 - The tripping coil is energised, isolating the circuit (1 mark)

(b) Any THREE of:-

- It cannot safely interrupt high short circuit currents
- The fuse element is not sealed and may not eliminate arcing.
- It is not obtainable in a range of Utilisation category (fusing factors).
- The current rating is not clearly marked.
- Has no reliable operation within prescribed limits.
- Poor discrimination.
- Inconsistent fusing characteristics.
- Slower operation/acting.
- Deteriorates over time.

(3 marks)

(c) Any THREE 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.
- The utilisation category (fusing factor) is most likely changed.

(3 marks)