

ESTA 1037 - 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) 0.38A | multi-choice answer – (1) |
| (b) A short circuit | multi-choice answer – (4) |
| (c) A 230/230 volt isolating transformer | multi-choice answer – (2) |
| (d) 10A | multi-choice answer –(2) |
| (e) One element only across the supply | multi-choice answer –(3) |
| (f) 1.8 kW | multi-choice answer – (4) |
| (g) 1 Meg Ohm | multi-choice answer – (1) |

(h) A sustained overload

multi-choice answer – (1)

(i) The same

multi-choice answer – (4)

(j) The cross sectional area of the flexible cord conductors

multi-choice answer – (2)

Question 2

$$(a) R_T = \frac{R_1 \times R_2}{R_1 + R_2} \quad (1/2 \text{ mark})$$

$$= \frac{40 \times 50}{40 + 50} \quad (1/2 \text{ mark})$$

$$= 22.22\Omega \quad (1 \text{ mark})$$

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

$$= \frac{230}{22.22} \quad (1/2 \text{ mark})$$

$$= 10.35A \quad (1 \text{ mark})$$

$$(b) P = VA \quad (1/2 \text{ mark})$$

$$= 230 \times 10.35 \quad (1/2 \text{ mark})$$

$$= 2380 \text{ W} \quad (1 \text{ mark})$$

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

$$= \frac{230 \times 230}{40} \quad (1/2 \text{ mark})$$

$$= 1320W \quad (1 \text{ mark})$$

The power dissipated would drop 1060W (1 mark)

(d) Yes. (1/2 mark)

- It would rise to 2590W because the power dissipated is proportional to the square of the supply voltage.

or

- A higher voltage will push more current through the appliance and, therefore, dissipate more power.

(1/2 mark)

Question 3

(a) The sequence of actions has to show:

- Removal of the cable sheath. (½ mark)
- Removal of the basic insulation from conductors. (½ mark)
- Applying cord clamp to sheath (½ mark)
- Terminating conductors at terminals. (½ mark)

- (b)
- Ensure there is no damage to the conductor cores (½ mark)
 - Ensure the basic insulation is up to the terminals. (½ mark)
 - Ensure the clamp secures the sheath of the cable and not the conductors (½ mark)
 - Ensure the conductors are terminated to the correct terminals. (½ mark)
 - Ensure that the protective earthing conductor is longer than the other conductors, where possible. (½ mark)

(c) Ensure there are no exposed conductors or basic insulation. (½ mark)

- (d)
- Protective earthing conductor test. (½ mark)
 - Any instrument that can accurately read values of less than 1Ω . (½ mark)
 - 1Ω maximum (½ mark)
 - Test between the earth pin of the plug and the frame of the appliance. (½ mark)
 - Insulation resistance test. (½ mark)
 - Insulation resistance tester (½ mark)
 - 500V d.c (½ mark)
 - $1\text{ M}\Omega$ minimum (½ mark)
 - Bridge out the phase and neutral pins of the plug and test between that bridge and the earth pin. (1 mark)

Question 4

- (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)
EA 100
(1 mark)
- (iii) The Registrar
(accept EWRB)
100(4)
(1 mark)
- (b) • Safe working practices
• Testing
• CPR
• Basic first aid
ER 25
(4 marks)
- (c) Any TWO of:
- The name of the person so notifying and the place at which that person may be contacted (including where possible a telephone number and facsimile number):
 - The place, date, and time of the accident:
 - A complete description of the accident:
 - A description of any injuries, damage, or losses resulting from the accident:
 - Where known, the names and contact information of any witness, investigator at the scene, or other person who could provide cogent information on the accident:
 - Possible causative factors (if any are known):
 - Any resuscitation applied, including the method, the length of time applied, the reason for discontinuing, and the person that applied the resuscitation:
 - Any associated equipment involved, including the type, whether or not it operated correctly, and any reasons why it did not operate correctly:
 - The condition of the associated equipment involved, including its age:
 - Where known, the name, age, sex, occupation, and residential address of the victim.
- ER 106(1)
(3 marks)

Question 5

- (a) (i) Overload caused by too many appliances in use. (1 mark)
- (ii) • The fusing current is $20 \times 1.5 = 30\text{A}$ (1 mark)
- Total up the rating of appliances from their name-plates to establish that the total loading exceeds 30A. (1 mark)
- (iii) Recommend that fewer appliances be used. (1 mark)
- (b) (i) A faulty appliance. (1 mark)
- (ii) • On each appliance, carry out an insulation resistance test between the bridged out active and neutral and the frame of the appliance. (2 marks)
- Use an insulation resistance tester. (½ mark)
- The test voltage is 500V d.c. (½ mark)
- If there is a fault on the appliance the test result should be significantly less than 1 MΩ. (1 mark)
- (iii) Repair the faulty appliance
or
Put an "out-of-service tag" on the appliance and send away for repair. (1 mark)

Question 6

(a) (i) 250 V d.c.

AS/NZS 3760: 2.3.3.2(b)
(1 mark)

(ii) 1 M Ω or greater

AS/NZS 3760: Table 2
(1 mark)

(b) (i) Leakage current test

AS/NZS 3760: 2.3.3.2(a)
(1 mark)

(ii) 5 mA or less

AS/NZS 3760: Table 1
(1 mark)

(c) Any TWO of:

- Bridge phase and neutral, and test between the bridge and earth.
- Bridge out the semi-conductor devices before testing.
- Use a 250V d.c. insulation resistance tester

(2 marks)

(d) (i) 500 V d.c.

(1 mark)

(ii) 1 M Ω or greater

(1 mark)

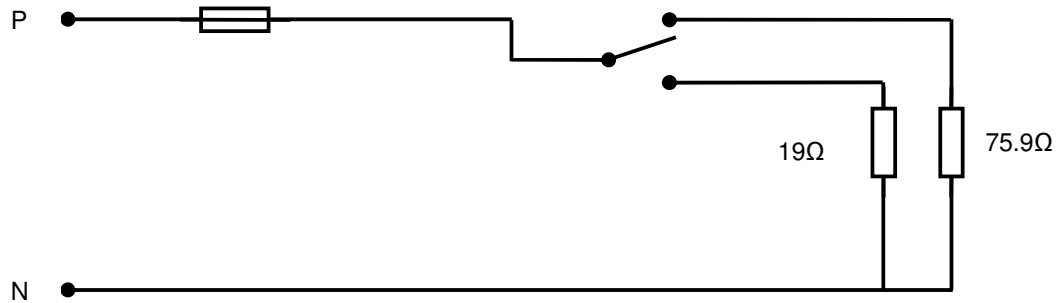
(iii) Any ONE of:

- Bridge phase and neutral, and test between the bridge and earth.
- Test between phase and earth and neutral and earth.

(2 marks)

Question 7

(a)



- Fuse is in the phase (1/2 mark)
 - The switch is in the phase (1/2 mark)
 - The fuse protects both resistors. (1/2 mark)
 - The two-position selector switch has two distinct positions. (1/2 mark)
 - The resistors are connected so two different load settings are achieved. (1 mark)
- (Total 3 marks)

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

$= \frac{230}{75.9}$ (1/2 mark)

$= 3.03A$ (1 mark)

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

$= \frac{230}{19}$ (1/2 mark)

$= 12.1A$ (1 mark)

(d) $P = \frac{V^2}{R}$ (1/2 mark)

$= \frac{230 \times 230}{75.9}$ (1/2 mark)

$= 696.97 \text{ watts}$ (1 mark)

(e) More (1 mark)

Question 8

- (a) A Phase
- B Centrifugal switch
- C Start Capacitor
- D Start winding
- E Run winding
- F Neutral

(3 marks)

- (b) Reverse the connections of "D" - the start winding
or
Reverse the connections of "E" - the run winding.

(1 mark)

- (c) (i) The motor would not start.

(1 mark)

- (ii) No effect.

(1 mark)

- (d) (i) The motor would not start.

(1 mark)

- (ii) The motor would slow down until the centrifugal switch closed.

(1 mark)

The motor will speed up again as the start winding is energised.

(1 mark)

The centrifugal switch will open at around 75% full-load speed so the motor will cycle as the switch opens and closes.

(1 mark)

Question 9

- (a) In respect of electricity supplied by either as single-phase MEN system or multiple-phase MEN system, a nominal voltage of 230 volts a.c. between phase and neutral

ER2
(1 mark)

- (b) (i) Means any voltage exceeding 50 volts a.c. or 120 volts ripple free d.c. but not exceeding 1,000 volts a.c. or 1,500 volts d.c.

(ER2)
(1 mark)

- (ii) Means contact, by any person or animal, with live parts, including contact by any thing being carried or worn by that person or animal

(ER2)
(1 mark)

- (iii) In relation to fittings or electrical appliances, means that the fittings or appliances are deliberately disconnected from any source of electricity

(ER2)
(1 mark)

- (iv) Means contact, by a person or animal, with exposed conductive parts that are live under fault conditions, including contact by any thing being carried or worn by that person or animal

(ER2)
(1 mark)

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

(1 mark)

- (d) (i) a.c.

(1 mark)

- (ii) 1 Peak value

(½ mark)

325V

(½ mark)

2. RMS value

(½ mark)

230V

(½ mark)

3. Periodic time or time interval or one complete cycle

(½ mark)

0.02s or 20 ms

(½ mark)