# 2008- Electrical Service Technician "B"
# 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 |

## Question 1

(a) Any ONE of:

- To protect the fixed wiring against excess current flow
- Safely interrupt and disconnect a faulty circuit

(2 marks)

(b) It can be any colour except Black, Light Blue , Green, or Green/Yellow

(2 marks)
AS/NZS 3000: Table 3.5

(c) Any TWO of:

- The appliance is fixed wired and connected through a continuous flexible cord to a supply of electricity from a source isolated from earth with a voltage between conductors not exceeding 250 volts:

  ER 77(3)(a)
- The appliance is supplied with electricity from a safety extra-low voltage source:

  ER 77(3)(b)
- The appliance is double-insulated and is supplied with electricity through a residual current device.

  ER 77(3)(c)

(2 marks)

(d) $I = \frac{W}{V}$

(½ mark)

$= \frac{920}{230}$

(½ mark)

$= 4A$

(1 mark)

(e) Any ONE of:

- To provide close protection and limit the PSSC.
- To provide back-up protection for thermal motor protection.

(2 marks)

**Question 2**

(a) Any TWO of:

- Select the right type of cord for the environmental conditions of use
- Select a cord with the correct current rating
- Do not put excessive weight or strain on flexible cords.
- Mechanical strength
- Correct voltage rating
- Requires minimum of three conductors
- Temperature rating

(2 marks)

(b) Any FOUR of:

- A four-plate ceiling rose
- In control thermostats
- In control sensors
- In control wiring, sump heaters in commercial refrigeration units
- If the supply conductors have become transposed and the switch is switching the neutral.
- Run-on timers.
- Switching of neutral conductor.

(2 marks)

(c) Any TWO of:

- Current rating
- Voltage rating
- Category of duty (Rupturing Capacity)
- Utilisation category (fusing factor) (Class)

(2 marks)

(d) The cross sectional area of the flexible cord conductors (conductor size)

(2 marks)

(e)
- A fault in the fixed wiring or socket outlet

(1 mark)

- A registered electrician must be called to fix it

(1 mark)

**Question 3**

(a) (i) Ingress protection or International protection.

(1 mark)

(ii)
- The degree of protection of persons against live or moving parts inside the enclosure
- And protection of the fitting against ingress of solid foreign bodies

AS 1939 supplement 1 – 1990
(2 marks)

OR

- The degree of protection against solid objects
- Protection of persons against access to hazardous parts.

AS/NZS 3000: 1.4.58

(iii) Protection of equipment against harmful ingress of water.

AS 1939 supplement 1 – 1990
(2 marks)

OR

A degree of protection against entry of water with harmful effects.

AS/NZS 3000: 1.4.58

(b) A situation in which moisture is either permanently present, or intermittently present to such an extent as would be likely to impair the effectiveness or safety of an electrical installation which complies with this Standard for ordinary situations.

Ref: AS/NZS 3000: 1.4.37
(2 marks)

(c) **5** represents protection against dust to allow satisfactory operation of the equipment.
**6** represents protection against conditions on a ship's deck or a strong jet of water.
(also accept definition wording as per AS 1939 supplement 1.)

(3 marks)

**Question 4**

(a) AS/NZS 3760

ER38(3)
(1 mark)

(b) Test: Protective earthing test
Instrument Low reading ohmmeter or any other instrument incorporating a low ohms scale
Result Not more than 1 ohm

AS/NZS 3760: 2001: 2.3.3.1
AS/NZS 3760: 2003: 2.3.3.1
(3 marks)

Test: Insulation resistance test
Instrument 500 V d.c. insulation resistance tester
Result Not less than 1 Mohm

AS/NZS 3760: 2001: 2.3.3.2
AS/NZS 3760: 2003: 2.3.3.2, Table
(3 marks)

(c)
- To ensure that the control switch is connected in the phase conductor.
- P – P terminal, N – N terminal, PEC – frame.
- To ensure that the metal framework is connected to the earth conductor.

(3 marks)

**Question 5**

(a)
- Check and prove isolation using Prove-Test-Prove method.
(1 mark)
- Add your own Danger Tag to the isolator.
(1 mark)

(b) For the sewing machine and flexible cord:
(1 mark)
- Insulation resistance test between active and neutral, active and earth and neutral and earth.
(1 mark)

Insulation resistance tester - 1 MΩ minimum
(1 mark)
- Protective earthing conductor test from machine frame to known good earth
(1 mark)

Low reading ohmmeter or multi meter – maximum 1Ω
(1 mark)

(c)
- Connect the machine supply cord and ensure the connections are correct
(1 mark)
- Check all screens and guards are in place.
(1 mark)
- Remove Danger Tag and check the machine for operational safety.
(1 mark)

**Question 6**

(a)
- Locate and identify appropriate isolating point.

(1 mark)

- Isolate - and attach a danger tag to isolating point.

(1 mark)

- Check for isolation at equipment input terminals (use prove-test-prove method).

(2 marks)

(b) (i)
- The motor will operate normally

(1 mark)

- The protective earthing conductor is the wrong colour – potential hazard.

(1 mark)

(ii)
- The motor will not operate

(1 mark)

- Its framework will be alive at 230V to earth

(1 mark)

- An immediate and serious shock hazard exists.

(1 mark)

(c) Any ONE of:

- Earth continuity test
- Polarity test
- Insulation resistance test between the phase conductor and the motor frame.

(1 mark)

**Question 7**

(a) Any TWO of:

- Mechanical overload
- Supply voltage insufficient
- Loss of one line or circuit
- Seized motor
- Open circuited rotor
- Bearing fault (poling)

(2 marks)

(b) Any TWO of

- Loss of one line
- Open circuited rotor bars
- Open or faulty windings
- Reversal of polarity of stator winding
- Bearing fault (poling)
- Mechanical overload

(2 marks)

(c) Any TWO of:

- The pole faces of the contactor iron circuit are not making correctly – excessive dirt or dust
- Insufficient voltage to close the iron circuit.
- Broken or missing shading ring in the laminated iron core of the contactor
- Pole face is cracked or core laminations are loose.

(2 marks)

(d) Any TWO of:

- The maintaining circuit is open-circuited.
- The maintaining contact across the start button is incomplete.
- Incorrectly wired circuit

(2 marks)

(e) Any TWO of:

- Open circuited or short-circuited or faulty capacitor
- Open circuited centrifugal switch at rest
- Open start winding circuit

(2 marks)

**Question 8**

(a) (i)
- The high impedance of the voltmeter means the appliance will not operate.

(1 mark)

- A reading of 230V would relate to the voltmeter, not the appliance.

(1 mark)

- A 0V reading may indicate that the circuit is dead when it is not.

(2 marks)

(ii) The highest range of the meter.

(1 mark)

(b)
- The supply and/or the appliance would be short-circuited because the ammeter is low impedance.

(2 marks)

- Personal hazard – flash burns.

(1 mark)

- Meter and/or circuit protection would operate.

(1 mark)

- Meter and/or appliance components could be damaged.

(1 mark)

**Question 9**

(a)
- With all control switches on

(1 mark)

- Bridge out phase and neutral to avoid damage to electronic components

(2 marks)

- Test with a 500V (or 250V) d.c. insulation resistance tester to test between bridge and earth.

(2 marks)

- The result must not be less than 1 Megohm

(1 mark)

(b)
- Visual inspection
- Continuity of conductors
- Verification of polarity
- Continuity of Earthing

(4 marks)

**Question 10**

(a) • To prevent dangerous voltages occurring.

(1 mark)

Between the exposed metal parts of the two electrical appliances under fault conditions, i.e., when two simultaneous faults occur

(2 marks)

• The bonding conductor ensures that a voltage will not exist and that sufficient current will flow in the secondary circuit to operate the fuse/s or thermal cut out.

(2 marks)

(b) **L2/53.1A**

(b) (i) Items of apparel and equipment worn by a person that are intended either to prevent the occurrence of harm to the person or to minimise any harm that may occur from hazards that are present in the workplace or hazards that may arise in the course of work

ER 2
(1 mark)

(ii) (1) Before beginning the work, to check that any associated equipment and personal protective equipment to be used by that person is in good order and condition, and is safe for its intended use

ER 36(2)(a)
(1 mark)

(2) To use the associated equipment and the personal protective equipment provided in a competent manner.

ER 36(2)(c)
(1 mark)

(c) Any FOUR of:

- Safety glasses or face shield
- Rubber insulating gloves
- Apron
- Safety boots
- Full body cover overalls
- Ladder (safe working platform)

(2 marks)