

ESTB 2030 - Electrical Service Technician "B" Answer Schedule

- Notes:
- (1 mark) means that the preceding statement/answer earns 1 mark.
 - This schedule sets out the accepted answers to the examination questions. A 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
 - Those parts of an answer that are under-lined indicate the parts required to be covered by a candidate.

Question 1

- (a) A registered electrical service technician who has had in total not less than three years' qualifying experience.
- EA 2
(2 marks)
- (b) (i) A nominal voltage of 230 volts between phase and neutral.
- (1 mark)
- (ii) Means any voltage exceeding 50 volts a.c. or 120 volts ripple free d.c. but not exceeding 1000 volts a.c. or 1500 volts d.c.
- (1 mark)
ER 2
- (c) Any TWO of:
- Safe working practices
 - Testing
 - Basic first aid
 - CPR
 - The technical content of problem areas identified by the Board
- ER Schedule 5 (2)
(2 marks)

- (d) Means that there is no significant risk of injury or death to any person, or of damage to any property, as a result of the use of the works, electrical installations, fittings, electrical appliances, or associated equipment, or the passage of electricity through those works, electrical installations, fittings, electrical appliances, or associated equipment, as the case may be.

ER 69(2)
(2 marks)

- (e) Any TWO of:

- Open circuited centrifugal switch
- Open start winding circuit
- Open circuited capacitor

(2 marks)

- (f) • When they are double insulated or Class II
• When they are supplied from an isolating transformer

(2 marks)

- (g) 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.

AS/NZS 3000:2000 1.4.37
AS/NZS 3000:2007 1.4.40
(2 marks)

- (h) Any TWO of

- Internal connections of one winding reversed
- Loss of one phase
- Open-circuited winding

(2 marks)

- (i) 6kA The maximum prospective short circuit current the breaker can safely open under fault conditions.
16A Is the nominal current rating of the breaker in normal service.

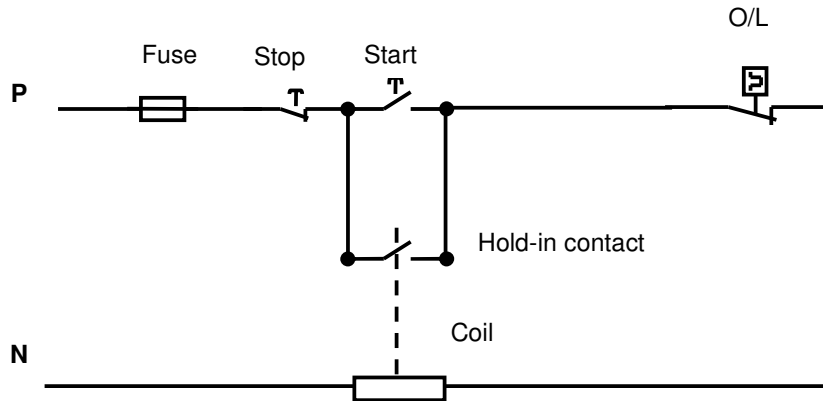
(2 marks)

- (j) It affects the level of voltage drop in the cord

(2 marks)

Question 2

(a)



- Correct polarity (phase and neutral) (½ mark)
 - Fuse protects the entire circuit (½ mark)
 - Stop button controls the entire circuit (except the fuse) (½ mark)
 - Start button correctly connected (½ mark)
 - Hold-in contacts correctly connected (½ mark)
 - Coil correctly connected (½ mark)
 - Thermal overload correctly connected (½ mark)
 - Working circuit (½ mark)
- (b) (i) Any ONE of:
- To protect the motor against a sustained overload or over current. (2 marks)
 - To protect against the phase imbalance of single-phasing (2 marks)
- (ii) The HRC fuses operate fast under excessive current conditions, and will disconnect the circuit before any damage occurs. (2 marks)
- (c) The motor would start but the contactor would drop-out as soon as the pressure is released from the start button. (2 marks)

Question 3

(a) The procedure has to show:

- Checking for isolation at the isolator using the prove-test-prove method. (1 mark)
- Attaching a Danger Tag to the isolator. (1 mark)

(b) The testing has to show:

- An insulation resistance test: (½ mark)
 - Using an insulation resistance tester. (½ mark)
 - Testing between active and neutral, active and earth and neutral and earth. (1 mark)
 - Test result of 1 MΩ - minimum (1 mark)
- A protective earthing conductor test (½ mark)
 - Using an instrument that can accurately read values of less than 1Ω (½ mark)
 - Testing between protective earthing conductor of the flexible cord and the press frame (1 mark)
 - Test result of 1Ω - maximum (1 mark)

(c) Any TWO of:

- Ensure the connections are correct
 - Check all screens and guards are in place.
 - Ensure the press is effectively earthed
 - Rotation of the machine
- (2 marks)

Question 4

(a) Any TWO of:

- Attach a danger tag to the isolator.
- Lock the isolator in the off position.
- Open and lock the MCBs
- Disconnect the cables at the load side of the isolator

(2 marks)

(b) • To ensure that the test meter/instrument - is operating correctly.
• To ensure that the circuit has been isolated before it is worked on.

(2 marks)

(c) • When two persons are working simultaneously on the machine.

(1 mark)

- When one person is working on machine and the supervisor has also placed his tag, e.g., an "Out of Service" tag.

(1 mark)

(d) Any FOUR of:

- Lock open the isolating switch
- Attach a safety warning tag to the isolating switch
- Lock open the MCBs
- Open the MCBs and attach a safety warning tag
- Disconnect the circuit at the switchboard
- Use an access permit or "hold card" system.

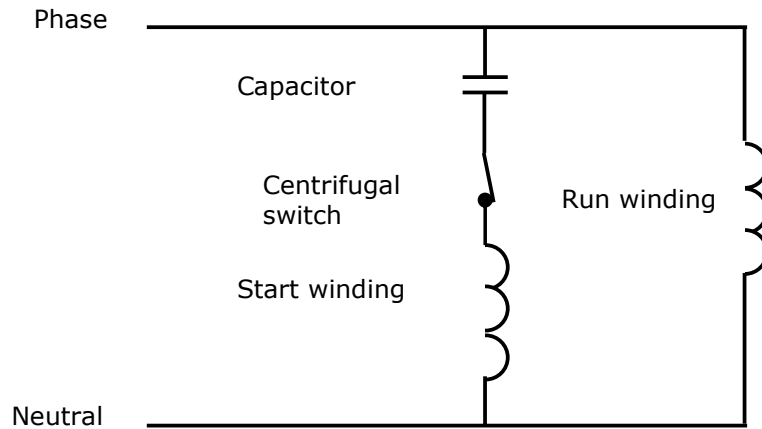
(4 marks)

Question 5

- (a) • The supply would be short-circuited. (1 mark)
- A personal hazard – flash burns.
or
Meter and/or appliance components could be damaged. (1 mark)
- (b) • A 0 volt reading can lead to the false conclusion that the circuit is dead. (1 mark)
- A 0 volt reading will be obtained if the appliance load is open circuited (by a switch or element) (1 mark)
- (c) Any FOUR of:
- Ensure the correct instrument is used.
 - Inspect instrument, clips, leads and probes to ensure they are in good condition.
 - Don't energise circuit until all connections have been completed.
 - Ensure correct range is selected on the instrument.
 - Ensure leads are correctly connected.
- (4 marks)
- (d) Any FOUR of:
- Insulation resistance test
 - Continuity of conductors
 - Verification of polarity
 - Continuity of Earthing
 - Live load test.
 - Correct circuit connections
- (2 marks)

Question 6

(a) (i)

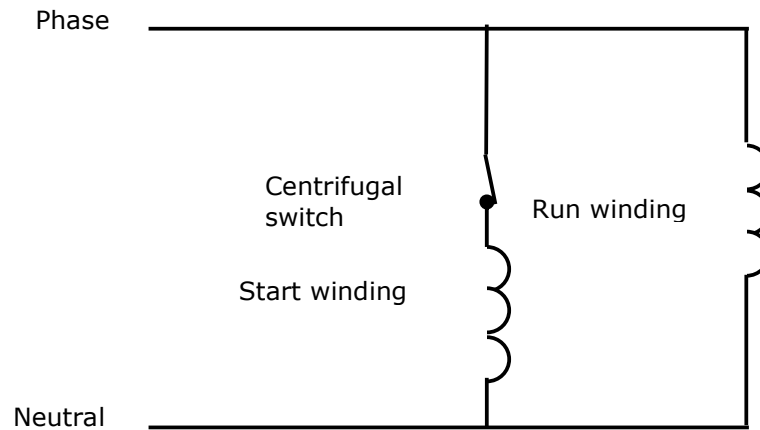


- Correctly connected start winding, capacitor and centrifugal switch (1½ marks)
- Correctly connected run winding (½ mark)

(ii) Reverse the connections of the start winding
or
Reverse the connections of the run winding. (1 mark)

(b) Reverse connections to the field windings
or
Reverse connections to the armature windings (1 mark)

(c) (i)



- Correctly connected start winding and centrifugal switch (1½ marks)
- Correctly connected run winding (½ mark)

(ii) Reverse the connections of the start winding
or
Reverse the connections of the run winding. (1 mark)

- (d)
- Open circuited or short-circuited or faulty capacitor
 - Open circuited centrifugal switch at rest
 - Open start winding circuit
- (3 marks)

Question 7

(a) (i) Any ONE of:

- A coding system to indicate the degree of protection provided by the enclosure against access to live parts from solid objects, or the ingress of water or other liquids
AS 1939 supplement 1 – 1990
- Degrees of enclosure protection for electrical equipment
AS 60529
- A degree of protection in accordance with AS 1939.
AS/NZS 3000:2000: 1.4.58
AS/NZS 3000:2007: 1.4.61
AS/NZS 3000:2007: G1
(2 marks)

(ii) Any ONE of:

- 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
- Protection against solid objects
AS 60529
- The degree of protection against solid objects
- Protection of persons against access to hazardous parts.
AS/NZS 3000:2000: 1.4.58
- Protection of against ingress of solid objects.
AS/NZS 3000:2007: Table G1(a)
(2 marks)

(iii) Any ONE of:

- Protection of equipment against harmful ingress of water.
AS 1939 supplement 1 – 1990
- Protection against liquids
AS 60529
- A degree of protection against entry of water with harmful effects.
AS/NZS 3000:2000: 1.4.58
- Protection of against harmful ingress of water.
AS/NZS 3000:2007: Table G1(b)
(2 marks)

(b) **3** Any ONE of:

- Protection of persons holding tools or wires (larger than 2.5 mm) and protection of equipment against objects larger than 2.5mm².
AS 1939 supplement 1
- Protected against solid objects over 2.5 mm (tools and small wires)
AS 60529
- The access probe of 2.5 mm diameter shall not penetrate.
AS/NZS 3000:2007: Table G1(a)
(1 mark)

4 Any ONE of:

- Protection against splashing and spraying water from all practicable directions.
AS 1939 supplement 1
- Protection against water sprayed from all directions – limited egress permitted.
AS 60529
- Protection against water splashed from all directions. Limited ingress permitted.

AS/NZS 3000:2007: Table G1(b)
(1 mark)

(c) (i) Must have a minimum degree of protection of IPX5

AS/NZS 3000:2000: 7.2.4.1(b)
AS/NZS 3000:2007: 6.3.4.1(b)
(1 mark)

(ii) Must have a minimum degree of protection of IPX4

AS/NZS 3000:2000: 7.2.4.1(c)
AS/NZS 3000:2007: 6.3.4.1(c)
(1 mark)

Question 8

- (a) Phase to Phase = 400V or alternatively L1-L2, L1-L3, L2-L3 = 400V
Phase to Neutral = 230V or alternatively L1-N, L2-N, L3-N = 230V
Phase to Earth = 230V or alternatively L1-E, L2-E, L3-E = 230V
Neutral to Earth = 0 V
(2 marks)
- (b) "Multiple Earthed Neutral System" or "MEN System" means a system of supply of electricity in which the neutral is connected to earth
(a) at the source of supply; and
(b) at points on the supply system; and
(c) at every electrical installation connected to that system.
(2 marks)
Ref: ER 2
- (c) • When the load on each phase is identical and no out of balance current exists
• When the load connected in delta
(4 marks)
- (d) (i) 50Hz
(1 mark)
(ii) 325 volts
(1 mark)

Question 9

- (a) • Protective earthing conductor test (½ mark)
- Any ONE of:
 - * Any meter that can accurately read values of less than 1Ω.
 - * An ohmmeter that is of Class 5 accuracy or better (½ mark)
 - 1Ω (½ mark)
 - Maximum (½ mark)
- AS/NZS 3760: 2001: 2.3.3.1
AS/NZS 3760: 2003: 2.3.3.1
- Insulation resistance test (½ mark)
- Insulation resistance tester (½ mark)
 - 500 V d.c. (1 mark)
 - 1 MΩ (½ mark)
 - Minimum (½ mark)
- AS/NZS 3760: 2001: 2.3.3.2
AS/NZS 3760: 2003: 2.3.3.2, Table
- (b) • Not less than 1 MΩ (½ mark)
- AS/NZS 3760: 2001: 2.3.3.3 or Appendix C3
Or
AS/NZS 3760: 2003: 2.3.3.3 (½ mark)
- (c) • To ensure that the control switch switches the active conductor.
• The active pin on the plug is connected to the active terminal in the appliance
• The neutral pin on the plug is connected to the neutral terminal in the appliance
• The earth pin on the plug is connected to the frame of the appliance. (4 marks)