

# Licensed Electrical Inspector Theory (LEIT) Assessment Sample Paper (April 2024) Marking Guide



## Questions 1-14: Standards, Regulations and the Act

### Question 1.

Answer: **No**, the ESR system shall **not** be installed in hazardous areas (2 marks)

Reference Document: AS/NZS 3000:2018 (1 mark)

Clause Number: 3.16(d) (2 marks)

### Question 2.

Answer: Identified by marking of its location on the switchboard at which the circuits supply the pool or spa originate, or other permanent location. (2 marks)

Reference Document: AS/NZS 3000:2018 (1 mark)

Clause Number: 5.6.2.6.3(b) (2 marks)

### Question 3.

Answer: Carry 125% of the continuous full load motor current and open the circuit in not less than 20 s at 600% of the full load motor current. (2 marks)

Reference Document: AS/NZS 3000:2018 (1 mark)

Clause Number: 7.2.5.6.2 (b) (i) (ii) (2 marks)

### Question 4.

Answer: 120 minutes (an answer of 2 hours also acceptable) (2 marks)

Reference document: AS/NZS 3000:2018 (1 mark)

Clause number: H1.3 Table H1 (2 marks)

### Question 5.

Answer: IP23 (2 marks)

Reference Document: AS/NZS 3012:2019 (1 mark)

Clause Number: 2.3.2.1(b) (2 marks)

### Question 6.

Answer: Each socket outlet on a service pillar shall be identified by suitable indelible means to indicate the site that it is intended to supply. (2 marks)

Reference Document: AS/NZS 3001.1:2022 (1 mark)

Clause Number: 2.4.6.3 (2 marks)

### Question 7.

Answer:

(a) By a competent person who has tools, testing equipment and personal protective equipment that –

- (i) are suitable for the work; and
- (ii) have been properly tested; and
- (iii) are maintained in good working order; and

(b) in accordance with a safe work method statement prepared for the work. (2 marks)

Reference Document: Electrical Safety (General) Regulations 2019 (1 mark)

Clause Number: 511 (1) (a) (b) (2 marks)

### Question 8.

Answer: At the origin of every circuit and at each point where a reduction occurs in the current carrying capacity of the conductors. (2 marks)

Reference Document: AS/NZS 3000:2018 (1 mark)

Clause Number: 2.5.1.3 (2 marks)

### Question 9.

Answer: No (2 marks)

Reference Document: AS/NZS 3004.1:2014 (1 mark)

Clause Number: 1.6.4(b) (2 marks)

### Question 10.

Answer: All elements for which the classification is sought, including any joints or components forming part of the wiring system. (2 marks)

Reference Document: AS/NZS 3013:2005 (1 mark)

Clause Number: Appendix A4.1 (2 marks)

### Question 11.

Answer: 3000mm or 3 metres (2 marks)

Reference Document: Electrical Safety (General) Regulations 2019 (1 mark)

Clause Number 303(2)(b) (2 marks)

### Question 12.

Answer: 60m (2 marks)

Reference Document: AS/NZS 3002:2021 (1 mark)

Clause Number: 2.7.5.4.3 Table 3.1 (2 marks)

### Question 13.

Answer: connected to the electricity supply (2 marks)

Reference Document: Electricity Safety Act 1998 (1 mark)

Clause Number: 45(1) (2 marks)

### Question 14.

Answer: A residual current device or an isolating transformer (2 marks)

Reference Document: AS/NZS 4836:2023 (1 mark)

Clause Number: 3.4 (2 marks)

### Question 15. Voltage Drop

**Mains** Heaviest loaded phase: Red phase 550A  
 $T41 V_c = 0.467V/A.m$  (1 mark)

$$I = 550/2 = 275A$$

$$V_D = (15 \times 275 \times 0.467/1000 = 1.93V$$

Single phase voltage drop  $1.93/\sqrt{3} = 1.11V$  (1 mark)

**Submains** Heaviest loaded phase: blue phase 63A  
 $T41 V_c = 2.43mV/A.m$  (1 mark)

$$V_D = (45 \times 63 \times 2.43)/1000 = 6.89V$$

Single phase voltage drop  $6.89/\sqrt{3} = 3.98V$  (1 mark)

**FSC**  $T42 V_c = 15.6 \times 1.155 = 18.02mV/A.m$  (1 mark)

$I = 20/2 = 10A$  (From AS/NZS 3000:2018 clause 3.6.2.exception 1; it is not necessary to quote this clause but must use correct current value based on this clause).

$$V_D = 35 \times 10 \times 18.02 = 6.31V \quad (1 \text{ mark})$$

Total volts lost (single phase) =  $1.11 + 3.98 + 6.31 = 11.4V$

Voltage at the terminals  $230-11.4 = 218.6V$  (1 mark)

The installation complies. (1 mark)

### Question 16. Cable Operating Temperature

$(I_o/I_R)^2 = (\Theta_o - \Theta_A)/(\Theta_R - \Theta_A)$  (This formula may be located in AS/NZS 3008.1.1 Clause 4.4)

Transposed for cable operating temperature  $\Theta_o = (I_o/I_R)^2 \times (\Theta_R - \Theta_A) + \Theta_A$

$$\Theta_o = (120/280)^2 \times (90-25) + 25 \quad (1 \text{ mark})$$

$$= 36.9^\circ C$$

(i) The cable operating temperature is  $36.9^\circ C$  (1 mark)

(ii) The effect would be to lower the value of  $V_c$ . (1 mark)

### Question 17. Prospective Fault Current

$$I_{(\text{fault current at transformer})} = \frac{750,000}{(400 \times \sqrt{3})} \times \frac{100}{6} = 18,042A \quad (2 \text{ marks})$$

$$Z_{(\text{transformer})} = 230 / 18042 = 0.01275\Omega \quad (1 \text{ mark})$$

$$Z_{\text{(mains active \& neutral)}} = \text{AS/NZS 3008.1.1:2017 Table 34 } R_c = 0.342 \Omega/\text{km} \quad (1 \text{ mark})$$

$$0.342 \times (15/1000) = 0.00513\Omega \times 2 = .01026 \Omega \quad (1 \text{ mark})$$

$$I_{\text{(MSB)}} = 230/(0.01275 + 0.01026) = \mathbf{9996A} \quad (2 \text{ marks})$$

$$Z_{\text{(Sub mains active \& Neutral)}} = \text{AS/NZS 3008.1.1:2017 Table 34 } R_c = 0.884 \Omega/\text{km} \quad (1 \text{ mark})$$

$$0.884 \times (37/1000) \times 2 = 0.06542\Omega \quad (1 \text{ mark})$$

$$I_{\text{(DB)}} = 230/(0.01275 + 0.01026 + 0.06542) = \mathbf{2601 A} \quad (2 \text{ marks})$$

### Question 18. Circuit Breaker Selection

$$I_a = \frac{0.8U_0S_{phSpe}}{L_{maxp}(S_{ph}+S_{pe})} \quad (\text{This formula may be located in AS/NZS 3000 clause B5.2.2})$$

$$I_a = \frac{0.8 \times 230 \times 50 \times 16}{160 \times 22.5 \times 10^{-3}(50 + 16)} \quad (1 \text{ mark})$$

$$I_a = 619.5A \quad (2 \text{ marks})$$

$$\begin{aligned} \text{Type B } I_a &= 4 \times \text{rated current} \\ &= 4 \times 100 = 400A \end{aligned} \quad (1 \text{ mark})$$

$$\begin{aligned} \text{Type C } I_a &= 7.5 \times \text{rated current} \\ &= 7.5 \times 100 = 750A \end{aligned} \quad (1 \text{ mark})$$

$$\begin{aligned} \text{Type D } I_a &= 12.5 \times \text{rated current} \\ &= 12.5 \times 100 = 12,500A \end{aligned} \quad (1 \text{ mark})$$

Therefore a Type B must be used. (1 mark)

### Question 19. Clearing Time

$$t = \frac{K_e I_r}{I_f^{1.5}} \quad (\text{This formula may be located in AS/NZS 3000 clause 2.5.5.3})$$

$$I_r = 1800A$$

$$I_f = 30\% \text{ of } 27kA = 0.3 \times 27,000 = 8100A \quad (1 \text{ mark})$$

$$t = \frac{250 \times 1800}{8100^{1.5}} \quad (1 \text{ mark})$$

$$t = 0.617 \text{ seconds} \quad (2 \text{ marks})$$

### Question 20. Earth Size

$$S = \sqrt{(I^2t/K^2)} \quad (\text{This formula may be located in AS/NZS 3000 clause 5.3.3.1.3})$$

K is taken from Table 52 AS/NZS 3008.1.1 with an initial temp of 25° (note: earth cables do not normally carry current therefore the initial temperature is always the ambient temperature of 25°C or 40°C for earthing conductors, and a final temp of 250° (from Table 53).

$$K = 179 \quad (2 \text{ marks: } 1 \text{ mark for Table no, } 1 \text{ mark for value})$$

$$S = \sqrt{(7000^2 \times 0.4/179^2)}$$

$$= 24.7\text{mm}^2 \quad (2 \text{ marks})$$

Use 25mm<sup>2</sup> cable (1 mark)

### Question 21. Circuit Breaker and Fuse Ratings

a) for a circuit breaker

$$I_B \leq I_N \leq I_Z$$

125 ≤ I<sub>N</sub> ≤ 133 Any circuit breaker with a rating between 125 and 133 inclusive may be used, therefore may use 125A or 130A (2 marks)

b) for a HRC fuse

$$I_B \leq I_N \leq 0.9 I_Z$$

$$125 \leq I_N \leq 0.9 \times 133$$

125 ≤ I<sub>N</sub> ≤ 119.7 not possible, therefore a HRC fuse cannot be used. (2 marks)

### Question 22. Cable Selection

$$T14: C23 = 251A \quad (2 \text{ marks})$$

$$\times 2 = 502A \quad (1 \text{ mark})$$

$$T25(2) = 0.87 \quad (1 \text{ mark})$$

$$\text{Answer Part (a)} = 436.7A \quad (1 \text{ mark})$$

$$T29: \text{Rating factor } 1.07 \text{ applied} \quad (1 \text{ mark})$$

$$\text{Answer Part (b) new current rating} = 467.3A \quad (1 \text{ mark})$$

### Question 23. Discrimination

$$C_1 \geq 1.5 \times C_{2\text{maximum permissible setting}}$$

$$600 \geq 1.5 \times C_{2\text{maximum permissible setting}}$$

$$C_{2\text{maximum permissible setting}} = 600/1.5 = 400A$$

$$\text{Max permissible} = 400A \quad (2 \text{ marks})$$