

Licensed Electrical Inspector Theory (LEIT) Assessment Sample Paper (July 2022) Marking Guide



Questions 1-16: 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: all live conductors (2 marks)

Reference document: AS/NZS 4777.1:2016 (1 mark)

Clause number: 3.4.5 (a) (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 3001:2008 (1 mark)

Clause number: 2.2.7.3 (2 marks)

Question 7

Answer: WARNING: HAZARDOUS d.c. VOLTAGE (2 marks)

Reference document: AS/NZS 5033:2021 (1 mark)

Clause number: 5.3.2 (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/NZS3000:2018 (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: exhaust gases, smoke or fumes (2 marks)

Reference document: AS/NZS 3010:2017 (1 mark)

Clause number: 2.2 (2 marks)

Question 11

Answer: 3000 (2 marks)

Reference document: Electricity Safety (General) Regulations 2019 (1 mark)

Clause number 303(2)(b) (2 marks)

Question 12

Answer: 20m (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 4836:2011 (1 mark)

Clause number: 3.4 (2 marks)

Question 15

Answer: AS 1670.4 (2 marks)

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

Clause number: 7.2.8.1 (2 marks)

Question 16

Answer: In an area where an authorized person will be aware of the signal. (2 marks)

Reference document: AS/NZS 5139:2019 (1 mark)

Clause number: 5.3.8 (2 marks)

Question 17 Voltage Drop

Mains Heaviest loaded phase: Red phase 550A

$T_{41} V_c = 0.467V/A.m$ (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

$T_{41} V_c = 2.43mV/A.m$ (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 $T_{42} V_c = 15.6 \times 1.155 = 18.02mV/A.m$ (1 mark)

$I = 20/2 = 10A$ (From AS/NZS3000:2018 clause 3.6.2.exception 1; it is not necessary to quote this clause but must use correct current value based on this clause).

$V_D = 35 \times 10 \times 18.02 = 6.31V$ (1 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 18 Cable Operating Temperature

$(I_o/I_R)^2 = (\Theta_o - \Theta_A)/(\Theta_R - \Theta_A)$ (This formula may be located in AS/NZS3008.1.1 Clause 4.4)

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

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

= 36.9°C

(i) The cable operating temperature is 36.9°C (1 mark)

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

Question 19 Prospective Fault Current

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

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

$$Z_{\text{(mains)}} \text{ AS/NZS3008.1.1:2017 Table 34 } R_c = 0.342 \Omega/\text{km} \quad (1 \text{ mark})$$

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

$$I_{\text{(MSB)}} = 230 / (0.01275 + 0.00513) = \mathbf{12,863A} \quad (12,864 \text{ also accepted}) \quad (2 \text{ marks})$$

$$Z_{\text{(sub mains)}} = \text{AS/NZS3008.1.1:2017 Table 34 } R_c = 0.884 \Omega/\text{km} \quad (1 \text{ mark})$$

$$0.884 \times (37/1000) = 0.03271\Omega \quad (1 \text{ mark})$$

$$I_{\text{(DB)}} = 230 / (0.01275 + 0.00513 + 0.03271) = \mathbf{4,546A} \quad (2 \text{ marks})$$

Question 20 Circuit Breaker Selection

$$I_a = \frac{0.8U_0 S_{ph} S_{pe}}{L_{max}(S_{ph} + S_{pe})} \quad (\text{This formula may be located in AS/NZS3000 clause B5.2.2})$$

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

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

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

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

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

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

Question 21 Clearing Time

$$t = \frac{K_e I_r}{I_f^{1.5}} \quad (\text{This formula may be located in AS/NZS3000 clause 2.5.5.3})$$

$$I_r = 1800A$$

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

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

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

Question 22 Earth Size

$$S = \sqrt{(I^2t/K^2)} \quad (\text{This formula may be located in AS/NZS3000 clause 5.3.3.1.3})$$

K is taken from Table 52 AS/NZS3008.1.1 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 25mm² cable (1 mark)

Question 23 Circuit Breaker and Fuse Ratings

a) for a circuit breaker

$$I_B \leq I_N \leq I_Z$$

125 ≤ I_N ≤ 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_N ≤ 119.7 not possible, therefore a HRC fuse cannot be used. (2 marks)

Question 24 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 25 Discrimination

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

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

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

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