

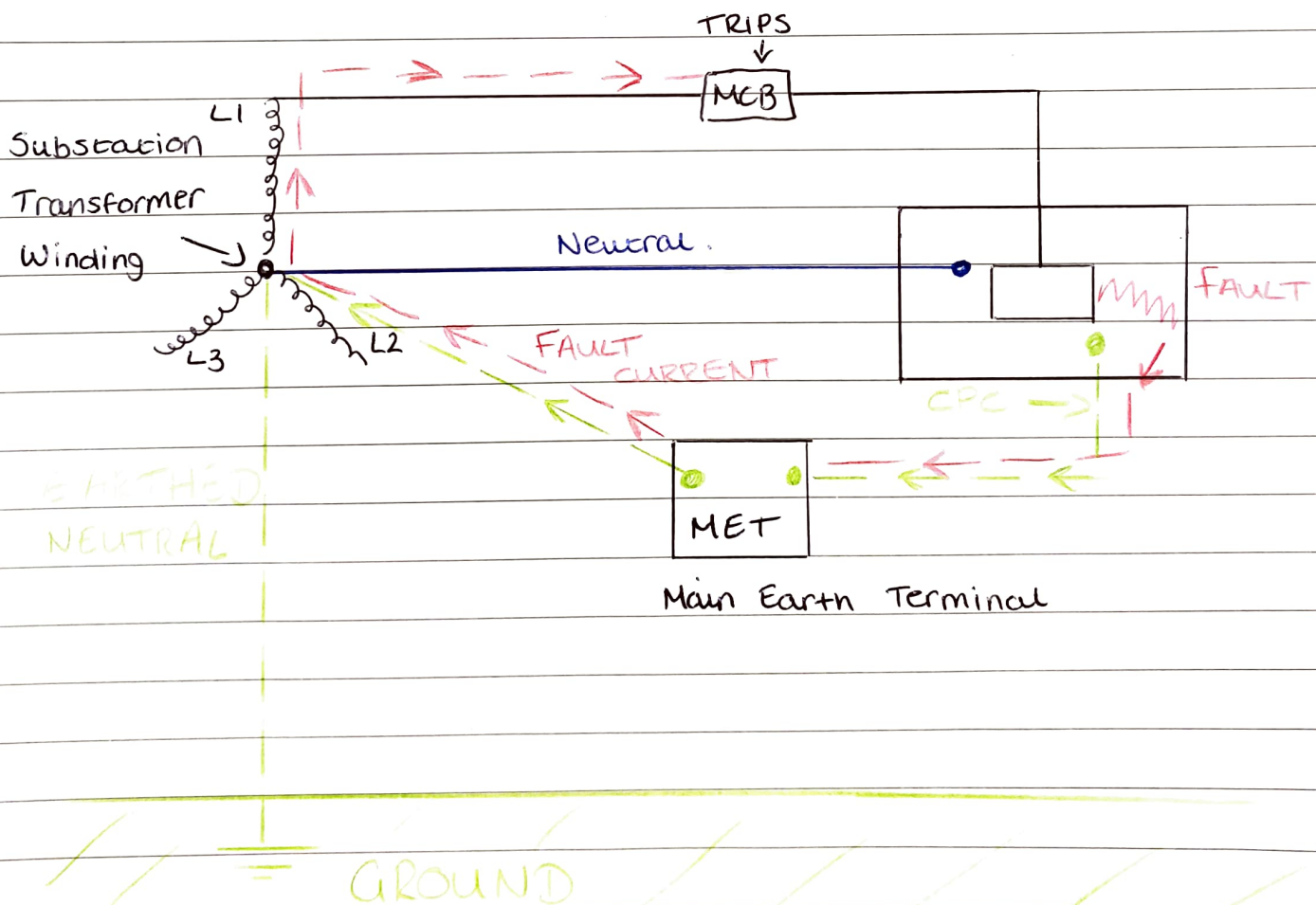
Q1. a) An exposed conductive part is something that should not normally be live but could become live under fault conditions.

Two examples would be metal conduit, water and gas pipes/metal framework.

b). The additional electrodes are required in the event the Neutral becomes an open circuit.

d). • Lower earth resistance.
• Smaller fault voltages.
• Earth is already installed by the distributor.
No earth rod required.

c). TNS Earth System. (Earth on Sheath)



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Q2) a) $R_1 + R_2 = (R_1 + R_2) \times \text{multiplier} \times \text{length}$

$$R_1 + R_2 = \frac{10.49 \times 1.2 \times 23}{1000}$$

$$R_1 + R_2 = 0.29 \Omega$$

$$Z_s = Z_e + (R_1 + R_2)$$

$$Z_s = 0.32 + 0.29$$

$$Z_s = 0.61 \Omega$$

$$I_f = \frac{V}{Z_s} = \frac{230}{0.61} = 377 \text{ Amps (fault current)}$$

b) 0.1 seconds.

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Q3) a). $I_b = 37 A$

$$I_n = 40 A$$

$$I_z = \frac{I_n}{C_a \times C_g \times C_i \times C_f \times C_c}$$

$$I_z = \frac{40}{0.94 \times 0.70 \times 1 \times 1 \times 1}$$

$$I_z = 60.8 \text{ Amps.}$$

Live conductor size will be 16 mm^2

$$R_1 + R_2 = (R_1 + R_2) \times \text{multiplier} \times \text{length}$$

$$R_1 + R_2 = \frac{2.3}{1000} \times \frac{1.2}{1000} \times 27$$

$$R_1 + R_2 = 0.07 \Omega$$

$$Z_s = Z_e + (R_1 + R_2)$$

$$Z_s = 0.6 + 0.07$$

$$Z_s = 0.67 \Omega$$

$$I_f = \frac{V}{Z_s} = \frac{230}{0.67} = 343.28 A$$

Disconnection Time = 0.2 s.

$$S = \frac{\sqrt{I^2 \times t}}{K} = \frac{\sqrt{(343.28)^2 \times 0.2}}{115} = \frac{1.334 \text{ mm}}{115}$$

$$\text{Minimum Earth size} = 1.334 \text{ mm}^2 \text{ CPC } 1.5 \text{ mm}^2$$

$$\text{Q4) a). } N = \frac{E \times A}{f \times u_f \times m_f} = \frac{300 \times 798}{13500 \times 0.8 \times 0.7} = 31.6$$

Number of Lamps required = 32.

$$\text{b). } E = \frac{I}{d^2} = \frac{10,000}{(6)^2} = 277.7 \text{ lux.}$$

c). I would arrange the lights in a regular pattern. This allows the spread of light to be equal in the building.

Regular
Pattern. →

x	x	x	x	x
x	x	x	x	x
x	x	x	x	x
x	x	x	x	x

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- Q5) a). 115 A - Brown a.
145 A - Black b.
200 A - Grey. c.

$$\sqrt{(I_a^2 + I_b^2 + I_c^2) - (I_a \times I_b) - (I_b \times I_c) - (I_a \times I_c)}$$

$$\sqrt{(115)^2 + (145)^2 + (200)^2 - (115 \times 145) - (145 \times 200) - (115 \times 200)}$$

$$\sqrt{74250 - 16675 - 29000 - 23000}$$

$$= 74.67 \text{ Amps.}$$

b). As the load we have is purely resistive the voltage and current are in phase with each other. Partly reactive loads the current will lead or lag the voltage. This will cause them to be out of phase.

c). Ensure all accessories within the rooms are labeled to which circuit and phase they are fed from.

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Q6) a). $6 \times 8.6 = 51.6$
 $9 \times 12.6 = 113.4$
 $6 \times 21.2 = 127.2$
 $3 \times 35.3 = 105.9$
Total = 398.1

Closest factor to
use is 738.

Dimensions = 75 x 25

b) $10\text{mm}^2 = 35.3$ $\frac{738}{35.3} = 20.9$

Therefore 20 10mm^2 cables can be enclosed
in the trunking selected.