

22/05/20

M4X00920

GAM93015545

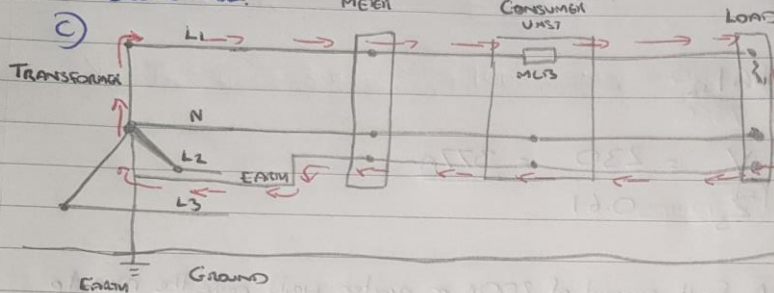
9.30am

EDWARD GAMMON

QUESTION ONE

a) Exposed metal work that is not normally live but could become live under fault conditions. Copper water pipes, mains gas pipe.

b) As the fault flows in the Combined Earth/Neutral - multiple earths reduce the risk of electric shock.



When there is a fault the current would flow down the earth, back to the local transformer and back down the line until the MCB ~~stop~~ operates and opens the circuit.

①) Lower Z_s value, more reliable - not subject to Z_s change due to weather conditions.

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GAM931PSS45

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QUESTION 2

$$A) Z_s = Z_e + \left(\frac{(R_1 + R_2) \times \text{multiplier} \times \text{Length}}{1000} \right)$$

$$= 0.32 + \left(\frac{10.49 \times 1.2 \times 23}{1000} \right)$$

$$Z_s = 0.61 \Omega$$

$$I_f = \frac{V}{Z_s} = \frac{230}{0.61} = 377 A$$

B) 0.1 s A Fault current of 200A or greater would cause the mcb to operate in 0.1 seconds.

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QUESTION 3

a) ~~Diagram~~
 $I_b = 37A$

$$I_n = 40A$$

$$I_2 = \frac{I_n}{C_g + C_n} = \frac{40}{0.7 \times 0.94} = \cancel{29.99} \quad 60.79A$$

16 mm² minimum Live conductor Size

$$V_d = \frac{m/V/A/m \times I_b \times L}{1000}$$

$$Z_s = Z_e + \frac{(R_1 + R_2) \times \text{Multiplier} \times \text{Length}}{1000}$$

$$= \frac{2.8 \times 37 \times 27}{1000}$$

$$= 0.6 + \left(\frac{2.3 \times 1.2 \times 27}{1000} \right)$$

$$= 2.78V$$

less than 11.5V

$$= 0.6 + 0.07$$

$$Z_s = 0.67\Omega$$

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

Disconnection time of 0.2 sec

$$S = \frac{\sqrt{I^2 t}}{k} = \frac{\sqrt{343.28^2 \times 0.2}}{115} < 1.33$$

$\therefore$ minimum CPC Size is 1.5 mm²

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GAM9301SS4S

Edmund Gammoth

QUESTION 4

a)
$$N = \frac{E \times A}{F_{amp} \times \eta}$$

$$= \frac{378 \times 300}{13500 \times 0.8 \times 0.7}$$

$$= \frac{113400}{7560}$$

$$= 15 \text{ lamps}$$

b)
$$E = \frac{I}{d^2}$$

$$= \frac{10000}{36}$$

$$= 277.78 \text{ Lux}$$

c)

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

In a regular pattern and evenly spaced.

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QUESTION 5

a)

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

$$I_a = 115A \quad I_b = 145A \quad I_c = 200A$$

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

$$I_n = \sqrt{\quad}$$

$$I_n = \underline{74.67A}$$

b) A vector diagram would have to be used to calculate the current in the neutral as the ~~rect~~ partly reactive load would alter the angle of the vectors.

c) To label all sockets and accessories to ensure that you know where they are supplied from.

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QUESTION 6

$$\begin{array}{ll} \text{a)} & 6 \times 1.5 \quad 6 \times 8.6 = 51.6 \\ & 9 \times 2.5 \quad 9 \times 12.6 = 113.4 \\ & 6 \times 6 \quad 6 \times 21.2 = 127.2 \\ & 3 \times 10 \quad 3 \times 35.3 = 105.9 \end{array}$$

398.1

Trunking Size 75 x 25mm

$$\text{b)} \quad 75 \times 25 \text{ mm Factor} = 738$$

$$10 \text{ mm}^2 \text{ Factor} = 35.3$$

$$\text{Total number of } 10 \text{ mm}^2 \text{ Cables} = \frac{738}{35.3} = 20.9$$

20 10mm² Cables