



12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

[illegible]

FORENAME(S): SAMUEL THOMAS

(Gweler yr ochr arall am y fersiwn Cymraeg)

92%



1,

A, 14 x 40m, 16,000 Lm, 370 Lux, UF 0.8, MF 0.7

$$N = \frac{E \times A}{F \times MF \times UF} = \frac{370 \times (14 \times 40)}{16,000 \times 0.7 \times 0.8} = 23.13 : \underline{24 \text{ Lamps}}$$

(5)

B,

$$E = \frac{I}{D^2} = \frac{8000}{8^2} = 125 \text{ Lux}$$

(3)

C,



3 ROWS OF
8 LAMPS PER
ROW SPACED
EVENLY ✓

(2)

Q1

$$\frac{10}{10} \checkmark$$



2,

a, 8m, 2 BENDS, TRUNKING

$$6 \times 1.5 \text{ mm}^2 \text{ SOLID} = 6 \times 8 = 48 \quad \checkmark$$

$$6 \times 2.5 \text{ mm}^2 \text{ SOLID} = 6 \times 11.9 = 71.4 \quad \checkmark$$

$$12 \times 6 \text{ mm}^2 \text{ STRANDED} = 12 \times 22.9 = 274.8 \quad \checkmark$$

$$12 \times 10 \text{ mm}^2 \text{ STRANDED} = 12 \times 36.3 = 435.6 \quad \checkmark$$

$$\text{TOTAL} = 48 + 71.4 + 274.8 + 435.6 = 829.8 \quad \checkmark$$

$$\text{TRUNKING SIZE} = \underline{100 \times 25} \quad \checkmark$$

$$b, 100 \times 25 \text{ TRUNKING FACTOR} = 993 \quad \checkmark$$

$$10 \text{ mm}^2 \text{ BS7211 THERMOSETTING FACTOR} = 36.3 \quad \checkmark$$

max

$$\text{NUMBER OF CABLES} = \frac{993}{36.3} = 27.36 : \underline{27 \text{ CABLES}} \quad \checkmark$$

Q2

$$\frac{5}{5}$$
$$\checkmark$$

3,

A, BROWN $\phi = 150A$, BLACK $\phi = 200A$, GREY $\phi = 60A$

$$I_N = \sqrt{(I_A^2 + I_B^2 + I_C^2) - (I_A \times I_B) - (I_B \times I_C) - (I_A \times I_C)}$$

$$I_N = \sqrt{(150^2 + 200^2 + 60^2) - (150 \times 200) - (200 \times 60) - (150 \times 60)}$$

$$I_N = \sqrt{(22500 + 40000 + 3600) - (30000) - (12000) - (9000)}$$

$$I_N = \sqrt{15100}$$

$$I_N = 122.88A$$

B, IF THE LOADS WERE PARTLY REACTIVE THEN THE NEUTRAL CURRENT WILL RISE.

C, SUPPLY SEPERATE ROOMS WITH SEPERATE PHASES, ROOMS SHOULD HAVE SIMILAR LOADS.

(1)

(1)

Q3

$$\frac{8}{10}$$

4,

Ans ~~40A~~ 39A LOAD, BS88-2 FUSE, 20M LENGTH, STEEL CONDUIT, 70° PVC SINGLES, REF METHOD B, 2 OTHER CCTS, AMBIENT TEMP 34°C, TN-S EARTHING, ZE = 0.58 Ω

$$I_B = 39A \quad \checkmark \quad \text{REF METHOD} = B$$

$$I_N = 40A \quad \checkmark$$

$$I_Z = \frac{I_N}{C_G \times C_A \times C_I \times C_F \times C_C} : \frac{40}{0.7 \times 0.94 \times 1 \times 1 \times 1} = 60.79A \quad \checkmark$$

$$\text{CABLE SIZE} = 16\text{mm}^2 \quad \checkmark$$

$$R_1 + R_2 = (R_1 + R_2) \times \text{MULTI} \times \frac{\text{LENGTH}}{1000} : \frac{2.3 \times 1.2 \times 20}{1000} = 0.06 \Omega \quad \checkmark$$

$$Z_S = (R_1 + R_2) + Z_E : 0.06 + 0.58 = 0.64 \Omega \quad \checkmark$$

$$I_F = \frac{UOC}{Z_S} : \frac{230}{0.64} = 359.38A \quad \checkmark$$

$$\text{DISCONNECTION TIME} = 0.2 \text{ SECONDS} \quad \checkmark$$

$$S = \frac{\sqrt{I^2 T}}{K} : \frac{\sqrt{359.38^2 \times 0.2}}{115} = 1.4\text{mm}^2 \quad \checkmark$$

(15)

Q4

15
15

5,

A, 230V, TN-C-S, $Z_E = 0.35 \Omega$, 10 mm^2 70°C T&E CABLE, 30m LENGTH

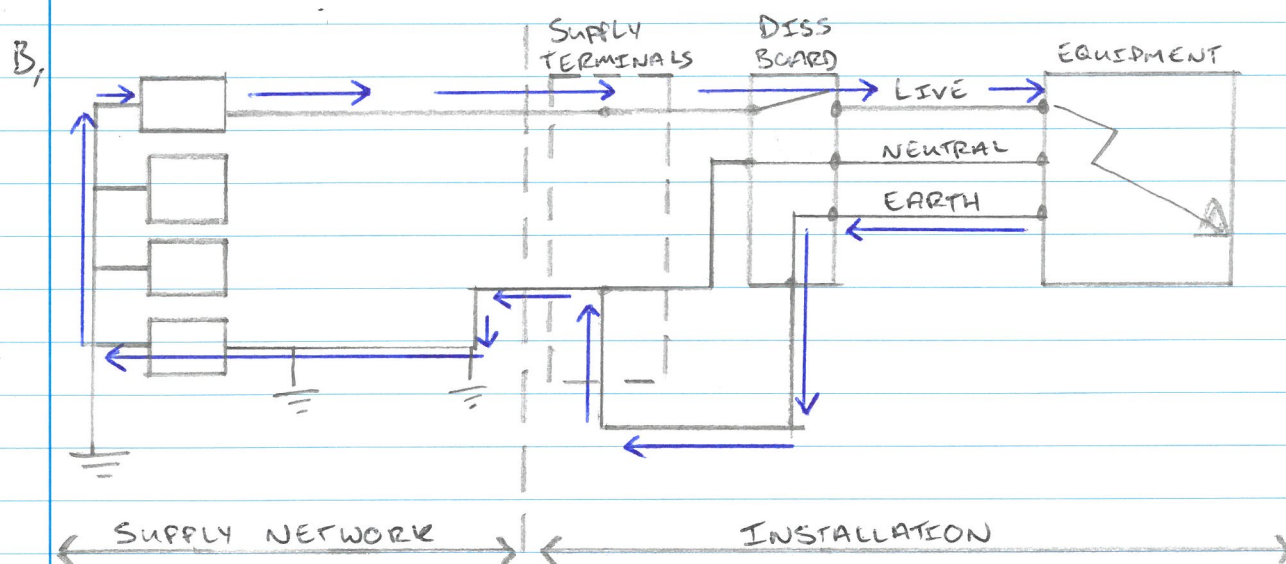
LINE CONDUCTOR = 10 mm^2
 PROTECTIVE CONDUCTOR = 4 mm^2 } DUE TO THE CABLE
 $(\text{m}\Omega/\text{m}) = 6.44$ ✓

$$R_1 + R_2 = \frac{(R_1 + R_2) \times \text{MULTI} \times \text{LENGTH}}{1000}$$

$$6.44 \times 1.2 \times \frac{30}{1000} = 0.23 \Omega \quad \checkmark$$

$$Z_S = (R_1 + R_2) + Z_E \quad \checkmark \quad 0.23 + 0.35 = 0.58 \Omega$$

$$I_f = \frac{U_{OC}}{Z_S} \quad \checkmark \quad \frac{230}{0.58} = 396.55 \text{ A}$$



Q5

8/10

✓

THE FAULT PATH IS SHOWN IN BLUE WHICH WOULD TRAVEL FROM THE EQUIPMENT ALONG THE EARTH AND COMBINED NEUTRAL/EARTH, ALONG THE LINE CONDUCTOR AND THROUGH THE CIRCUIT BREAKER. ✓

IT IS CALLED THE EARTH FAULT LOOP. ✓

(3)