



Examination Answer Books

12 Pages

Instructions to Candidates

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.**

Complete, fold and seal
(see note 2 below)

SURNAME:

Ivey

FORENAME(S):

James

1	Student Number	IVE20857781
2	Title of Examination Paper	Design of Electrical Installations
3	Module Code	G0EE4001
4	Date and Time of Examination	715/2024
5	Examination Venue	68860 Ward 2
6	Seat Number	A2
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	9 ✓
2	5 ✓
4	5 ✓
3	1 ✓
5	3 ✓
Total	23 50

46% *MM*

1A) 14m x 40m
16,000 Lumens
Minimum level of 370 lux

560 m

$$N = \frac{E \times A}{L \times UF \times MF}$$

$$= \frac{370 \times 560}{16000 \times 0.7 \times 0.8}$$

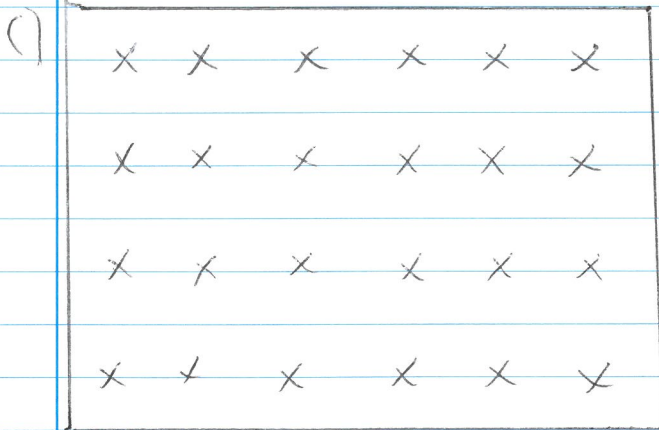
$$= 23.125 \text{ lights}$$

$$= 24 \text{ lights}$$

b) 8m below
8000 cd

$\frac{\text{Light}}{d^2}$

$$\frac{8000}{8^2} = 125 \text{ lux}$$



$$= 24 \text{ lights}$$

(5)

(3)

(1)

Q1

$\frac{9}{10}$

✓

2A) 8 metres long

2 bends

6 x 1.5 mm² PVC solid = 48 ✓

6 x 2.5 mm² PVC solid = 71.4 ✓

12 x 6 mm² thermosetting stranded = 274.8 ✓

12 x 10 mm² thermosetting stranded = 435.6 ✓

Total = 829.8 ✓

100 x 25 (mm x mm), factor of 993 ✓

b) 10 10 mm² = 36.3 ✓

27 of 10 mm² cables is the maximum

3A) ~~$\frac{P}{\sqrt{3} \times V}$~~

$$I \times V = P$$

$$150 \times 230 = 34500$$

$$250 \times 230 = 57500$$

$$50 \times 230 = 11500$$

$$= 103500$$

a)

94300 W or 94.3 kW

$$I_b = \frac{94300}{\sqrt{3} \times 230} = 236.71 \text{ A}$$

b) This would not affect the calculation

c) Check the fault current

Q2
5
5

(3)

(2)

- 4) Determine the live conductor and cpc sizes
 Load of 39 A
 B888-2 Fuse
 20 metres away
 70° PVC singles (ie method B1)
 2 other circuits (3 total)
 Ambient temp of 34°
 No thermal insulation
 $Z_e = 0.58 \Omega$

$$I_b = 39 \text{ A} \quad \checkmark \quad I_z = \frac{I_n}{(g \times c \times f \times i)} \quad \checkmark$$

$$\text{Cable size} = 57 \text{ A, } 10 \text{ mm}^2$$

$$\begin{aligned} \text{Voltage drop} &= \frac{V \times \text{length} \times \text{multiplier}}{1000} \\ &= \frac{230 \times 20 \times 1.2}{1000} \\ &= 5.52 \text{ V} \end{aligned}$$

$$R_1 + R_2 = \frac{(R_1 + R_2) \times \text{length} \times 1.2}{1000}$$

$$I_z = \frac{39}{0.94 \times 0.7 \times 1 \times 1.04}$$

Correct method used but
incorrect values.

$$I_z = 56.99 \text{ A}$$

$$\text{Cable size} = 10 \text{ mm}^2, 57 \text{ A}$$

$$\begin{aligned} R_1 + R_2 &= \frac{(R_1 + R_2) \times \text{length} \times \text{multiplier}}{1000} \quad \checkmark \\ &= \frac{(3.66) \times 20 \text{ m} \times 1.2}{1000} \end{aligned}$$

$$R_1 + R_2 = 0.087 \Omega$$

$$Z_s = 0.087 \Omega + Z_e$$

$$Z_e = 0.58$$

$$Z_s = 0.667 \Omega$$

$$4) I_s = \frac{U_{oc}}{Z_s} \checkmark$$

$$= \frac{230}{0.667}$$

$$I_s = 344.8 \text{ A}$$

$$S = \frac{\sqrt{I^2 \times t}}{k}$$

$$= \frac{\sqrt{344.8^2 \times 1}}{115}$$

$$S = 2.99 \text{ mm}^2 \text{ (2dp)}$$

3mm² would be the minimum live conductor and CPC size.

5) a) Single Phase 230V

TN-C-S

$Z_e = 0.35 \Omega$

10 mm² 70°C Thermoplastic T&E copper cable

~~$$\sqrt{I_a^2 + I_b^2 + I_c^2} \quad (I_a \times I_b) = (I_a + I_c) + (I_c \times I_b)$$~~

$$I_s = ?$$

(5)

Q4

5/15



$$3A) \sqrt{(I_a^2 + I_b^2 + I_c^2) + (I_a \times I_b) + (I_a \times I_c) + (I_b \times I_c)}$$

$$= \sqrt{I_a^2 + I_b^2 + I_c^2} = 257.1$$

$$= \sqrt{I_a \times I_b} = 173.2$$

$$= \sqrt{I_a \times I_c} = 94.87$$

$$= \sqrt{I_b \times I_c} = 109.54$$

$$\sqrt{257.1 + 173.2 + 94.87 + 109.54}$$

$$= 25.19 A$$

①

Q3

1/10



b) It would affect the diversity and neutral current

⑥

c) Increasing the neutral current

⑥

$$5) I_f = \frac{U_0 C}{Z_S}$$

$$R_1 + R_2 =$$

$$\frac{3.66}{1000} \times 1.2 \times 30 m$$

$$= 0.131 \Omega$$

Correct method,
incorrect value used.

$$Z_S = 0.131 \Omega + 2e$$

$$Z_S = 0.131 \Omega + 0.35 \Omega$$

$$Z_C = 0.481 \Omega$$

$$I_f = \frac{230}{0.481}$$

$$= 478.17 A$$

③

Q5

3/10



b) The fault current starts when the equipment gets power and follows along the green and yellow line then joins the blue line to ground.

⑥

5b). The ~~when~~ then fault current path is called the earth ~~current~~ current loop.