



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.

1	Student Number	10524876064
2	Title of Examination Paper	Electrical and Electronic Principles
3	Module Code	GOEE4003
4	Date and Time of Examination	20.05.24 1:30 PM
5	Examination Venue	ward 2 68860
6	Seat Number	F2
7	Number of Answer Books handed in	

Complete, fold and seal
(see note 2 below)

SURNAME: Roberts

FORENAME(S): Logan

List the numbers of the questions you have attempted	Office Use
Q1	5 ✓
Q2	0 ✓
Q3	9 ✓
Q4	21 ✓
Total	35/100 ✓

35%

Q1

i. $R_4 + R_3 = 7 + 13 = 20\Omega$ ✗

$R_{43} + R_6 = \frac{1}{\frac{1}{20} + \frac{1}{4.45}} = 3.64\Omega$

$R_{346} + R_5 = 3.64 + 11 = 14.63\Omega$

$R_{3456} = 14.63\Omega$ ✗

$R_7 + R_8 = 3 + 7 = 10$

$R_{78} = 10\Omega$ ✗

$R_{3456} + R_{78} = \frac{1}{\frac{1}{14.63} + \frac{1}{10}} = 5.94\Omega$

Total resistance = 5.94Ω ✗ 0

ii. Voltage at point A.

$10A - 2A = 8A$ ✓ ✓

$I = 8A$
 $R = 5.94$ ✗

Voltage = 8×5.94
 $= 47.52V$

Correct method
error carried
forward

iii. Power = $I^2 \times R$ ✓ 2

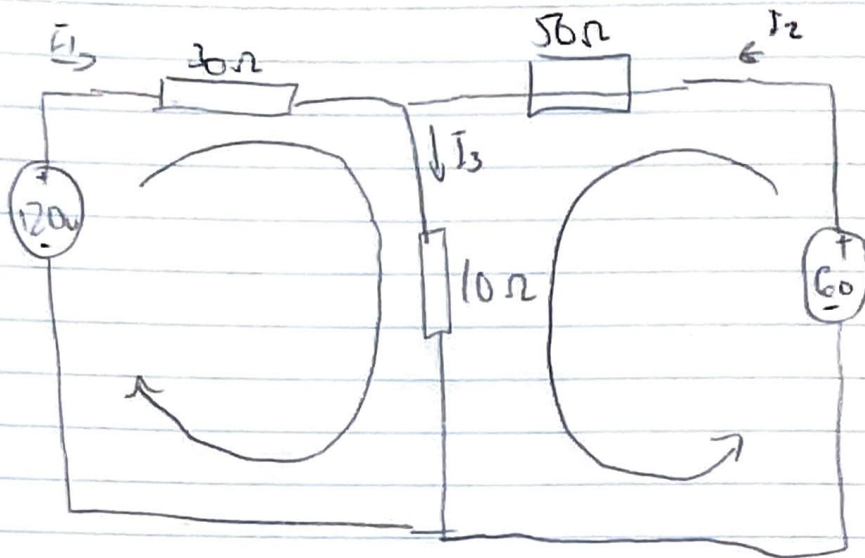
$= 8^2 \times 5.94$ error carried forward

Power = $380.16W$
 $= 380.16W$ ✓

Q1
5/20

Q2.

a)



$$\begin{aligned}
 (30 \times 120)I_1 + (10 \times 120)I_3 &= (60 \times 50)I_2 + (60 \times 10)I_3 \\
 3600I_1 + 1200I_3 &= 3000I_2 + 600I_3 \\
 I_1 3600 + 1200I_3 - 600I_3 &= 3000I_2 \\
 3600I_1 + 600I_3 &= 3000I_2
 \end{aligned}$$

✓ or

Q2b ??

Q2Q2a0/15Q2b0/15

Q4

a)

i. Current through R_1 and R_2

$$R_1 = \frac{12}{100 \times 10^3} \quad \times$$

$$R_2 = \frac{12}{22 \times 10^3} \quad \times$$

$$R_1 = 1.2 \times 10^{-4} \text{ A} \quad \times$$

$$= 5.45 \times 10^{-4} \text{ A} \quad \times$$

ii. Voltage across R_1 and R_2

$$R_1 = 1.2 \times 10^{-4} \times 100 \times 10^3 = 12 \text{ V} \quad \times$$

$$R_2 = 5.45 \times 10^{-4} \times 22 \times 10^3 = 12 \text{ V} \quad \times$$

$$12 - 0.7 = 11.3 \text{ V}$$

error carried forward 1

$$\text{iv. collector} = \frac{11.3}{4.7 \times 10^3} \quad \times$$

$$\text{emitter} = \frac{11.3}{22 \times 10^3}$$

$$\text{collector} = 2.4 \times 10^{-3} \text{ A} \quad \times$$

$$\text{emitter} = 5.14 \times 10^{-4} \text{ A} \quad \times$$

$$\text{v. } 4.7 \times 10^3 \times 2.4 \times 10^{-3} \text{ A} \quad \times$$

$$\text{voltage} = 11.3$$

Q421/30Q4a1/10

Q4

a)

: Current through R_1 and R_2

$$R_1 = \frac{12}{100 \times 10^3} \quad \times$$

$$R_2 = \frac{12}{22 \times 10^3} \quad \times$$

$$R_1 = 1.2 \times 10^{-4} \text{ A} \quad \times$$

$$= 5.45 \times 10^{-4} \text{ A} \quad \times$$

ii. Voltage across R_1 and R_2

$$R_1 = 1.2 \times 10^{-4} \times 100 \times 10^3 = 12 \text{ V} \quad \times$$

$$R_2 = 5.45 \times 10^{-4} \times 22 \times 10^3 = 12 \text{ V} \quad \times$$

iii. $12 - 0.7 = 11.3 \text{ V}$ ✓ error carried forward $\frac{1}{2}$

$$\text{iv. collector} = \frac{11.3}{4.7 \times 10^3} \quad \times$$

$$\text{emitter} = \frac{11.3}{22 \times 10^3}$$

$$\text{collector} = \frac{2.4 \text{ V}}{2.4 \times 10^{-3} \text{ A}} \quad \times$$

$$\text{emitter} = 5.14 \times 10^{-4} \text{ A} \quad \times$$

$$\text{v. } 4.7 \times 10^3 \times 2.4 \times 10^{-3} \text{ A} \quad \times$$

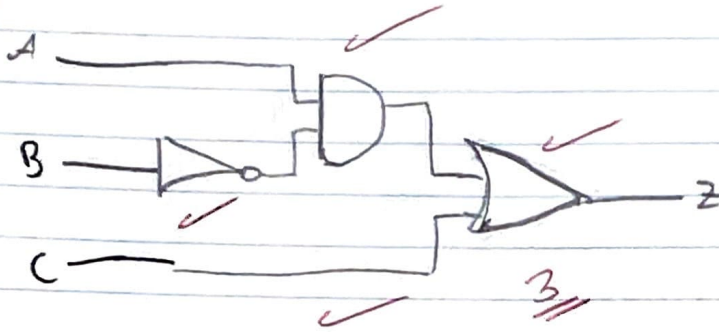
$$\text{voltage} = 11.3$$

Q421/30Q4a1/10

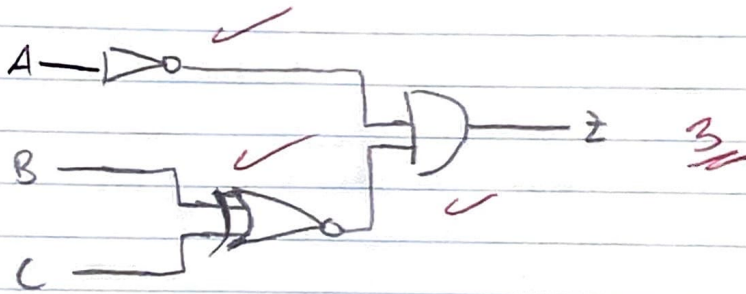
Q.4

b)

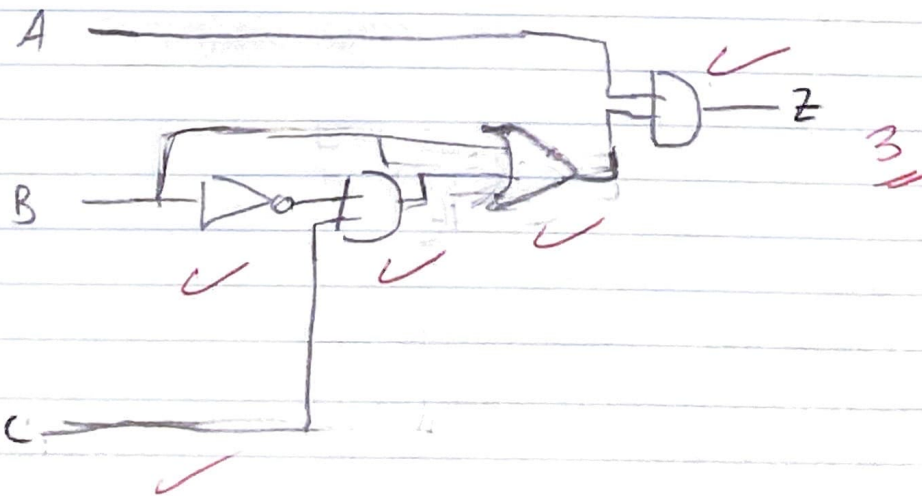
i. $Z = A \cdot \bar{B} + C$



ii. $Z = \bar{A} \cdot (B \oplus C)$



iii. $Z = A \cdot (B + \bar{B} \cdot C)$



Q4b

9/9

C.

$$i. ((AB) + C) \cdot B \quad \checkmark \quad \underline{\underline{2}}$$

$$ii. \bar{A} \cdot B + (\bar{B} + \bar{C}) \quad \checkmark \quad \underline{\underline{2}}$$

$$iii. (\overline{A \cdot B + \bar{C}}) + (\overline{B + C}) \quad \checkmark \quad \underline{\underline{2}}$$

$$\begin{aligned}
 d). \quad x &= \overline{(\bar{A} \cdot B) \cdot (\bar{A} + C)} \quad \checkmark \\
 &= \overline{(\bar{A} \cdot B)} + \overline{(\bar{A} + C)} \quad \checkmark \\
 &= (\overline{\bar{A} \cdot B}) + (\bar{A} \cdot \bar{C}) \quad \checkmark \\
 &= (\bar{A} + B) + (A \cdot \bar{C}) \quad \checkmark \\
 &= (\bar{A} \cdot \bar{B}) + (A \cdot \bar{C}) \quad \checkmark \\
 &= (\bar{A} \cdot B) + (A \cdot \bar{C}) \quad \checkmark
 \end{aligned}$$

Q4c6/6Q4d5/5

Q.3

i. $X_C = \frac{1}{2\pi fC}$ ✓

$$X_C = \frac{1}{2\pi \times 50 \times 100 \times 10^{-6}}$$

$$X_C = 31.83 \Omega$$

$$X_L = 2\pi f \times L$$

$$X_L = 2\pi \times 50 \times 150 \times 10^{-3}$$

$$X_L = 47.12 \Omega$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$Z = \sqrt{8^2 + (47.12 - 31.83)^2}$$

$$Z = 17.26 \Omega$$

ii.) Current flowing in circuit

$$\frac{240}{17.26} = 13.9 \text{ A}$$

iii. Voltage across the coil

$$V = I \times X_L = 13.9 \times 47.12$$

$$V_{\text{coil}} = 655.07 \text{ V}$$

Q3

9/20

IV. Voltage across the Capacitor

$$= 30 \times 100 \times 10^{-6} \times 0$$

$$\text{Voltage across Capacitor} = 3 \times 10^{-3} \text{ V}$$