



Complete, fold and seal
(see note 2 below)

SURNAME: Cartwright

FORENAME(S): Sam

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	Car19846934
2	Title of Examination Paper	Electrical and electronic Principles
3	Module Code	G0EE4003
4	Date and Time of Examination	20.05.24
5	Examination Venue	Ward 2
6	Seat Number	F3
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
Q1	15
Q2	21
Q3	12
Q4	13
Total	61 / 100

61%

Q1

$$i) R_{34} = \frac{13 \times 7}{13 + 7} = 4.55 \Omega \quad \underline{\underline{2}}$$

$$R_{34} + R_6 = 4.55 + 4.45 = 9 \Omega \quad \underline{\underline{2}}$$

$$\cancel{R_{34}} R_{3456} = \frac{1}{\frac{1}{9} + \frac{1}{11}} = 4.95 \Omega \quad \underline{\underline{2}}$$

$$R_{78} = \frac{3 \times 7}{3 + 7} = 2.1 \Omega \quad \underline{\underline{2}}$$

$$R_T = R_{78} + R_{3456} = 2.1 + 4.95 = 7.05 \Omega$$

$$V = I \times R \quad \underline{\underline{2}}$$

$$ii) \text{ } 10A - 2A = 8A \quad \underline{\underline{2}}$$

$$V = 8A \times 7.05 \Omega = 56.4V \quad \underline{\underline{3}}$$

$$iii) P = I^2 \times R = 8^2 \times 7.05 = 451.2W \quad \underline{\underline{2}}$$

iv) ??

Q1
15/20

Q2

a)

$$-120 + 30I_1 + 10(I_1 + I_2) = 0$$

$$-120 + 30I_1 + 10I_1 + 10I_2 = 0$$

$$40I_1 + 10I_2 = 120 \quad \underline{\underline{5}}$$

$$-60 + 50I_2 + 10(I_1 + I_2) = 0$$

$$-60 + 50I_2 + 10I_2 + 10I_1 = 0$$

$$60I_2 + 10I_1 = 60 \quad \underline{\underline{5}}$$

$$40I_1 + 10I_2 = 120 \quad (\times 0) = 40I_1 + 10I_2 = 120$$

$$10I_1 + 60I_2 = 60 \quad (\times 4) = 40I_1 + 240I_2 = 240$$

$$0 + -230 = -120$$

0

??

Q2

21/30

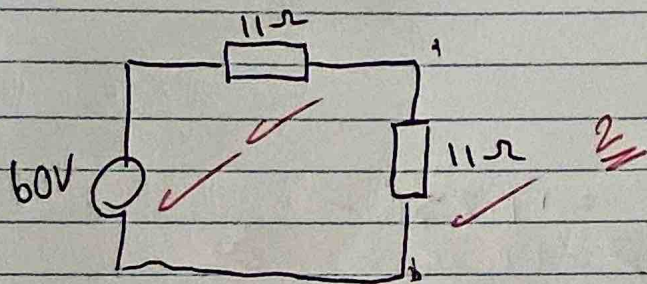
Q2a

10/15

$$b) V_{Th} = \frac{R_2}{R_1 + R_2} \times V_s = \frac{15}{10 + 15} \times 100 = 60V$$

$$R_{Th} = \frac{R_1 \times R_2}{R_1 + R_2} + R_3$$

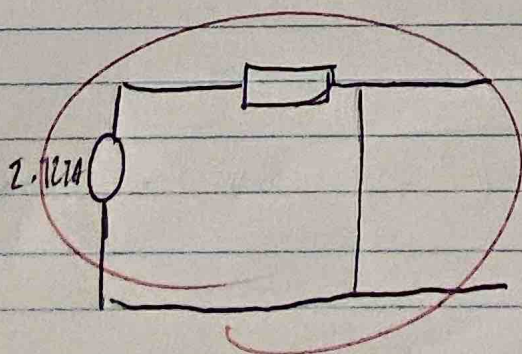
$$\frac{10 \times 15}{10 + 15} = 6\Omega + R_3 = 6\Omega + 5\Omega = 11\Omega$$



$$I = \frac{V}{R} = \frac{60}{22} = 2.727A$$

$$P = I^2 \times R = 2.727^2 \times 22 = 163.6W$$

iv Norton's equivalent



Q2b

11/15

Q3

$$\begin{aligned} mH &= -3 \\ \mu F &= -6 \end{aligned}$$

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

$$X_C = 31.83 \text{ units?}$$

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

$$X_L = 47.12 \text{ units?}$$

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

$$\sqrt{8^2 + (47.12 - 31.83)^2} = 17.256$$

$$Z = 17.26$$

$$V = I \times R = I = \frac{V}{R}$$

$$= \frac{240V}{17.26} = 13.90A$$

V across coil?

$$\sqrt{Z^2 (X_L)^2}$$

$$\sqrt{17.26^2 + (47.12)^2} = 50.18V$$

V across capacitor

$$\sqrt{Z^2 + (X_C)^2}$$

$$\sqrt{17.26^2 + (31.83)^2} = 36V$$

$$V. \quad \cos^{-1} \frac{R}{Z} = \cos^{-1} \frac{8}{17.26} = 62.38^\circ$$

$$vi \quad P = I^2 \times R$$

$$= 13.90^2 \times 17.26 = 3334.80 \text{ W}$$

Q4

$$a) \quad 122 \text{ k}\Omega \quad I = \frac{V}{R} = \frac{12 \text{ V}}{122 \text{ k}\Omega}$$

i)

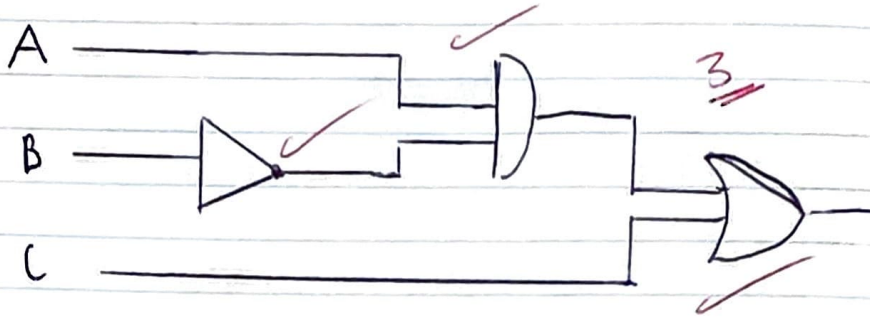
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Q413/30Q4a0

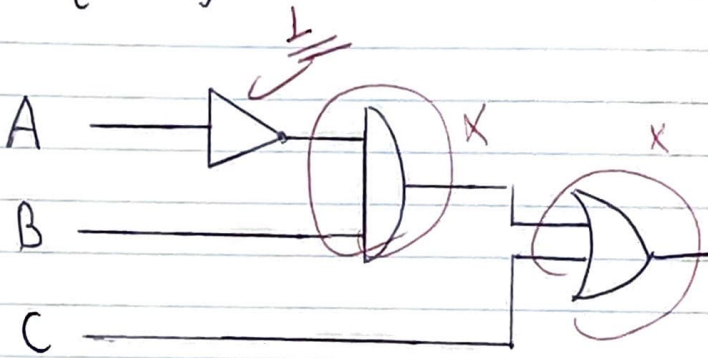
Q4

b)

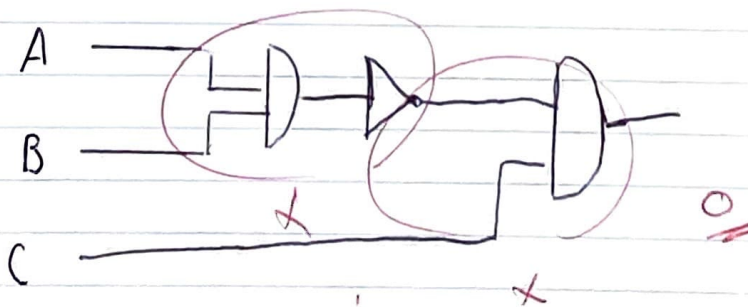
$$i) Z = A \cdot \bar{B} + C$$



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



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



Q4b

4/9

$$c) (A \cdot B + C) D$$

Q4c

$$ii) \bar{A} \cdot B + \bar{B} + \bar{C}$$

4/6

$$\bar{A} \cdot B + (\bar{B} + \bar{C})$$

2 0

$$d) X = \overline{(A \cdot B)(\bar{A} + C)}$$

Q4d

$$\overline{(A \cdot B) + (\bar{A} + C)}$$

5/5

$$(A \cdot B) + (\bar{A} + \bar{C})$$

$$(A \cdot B) + (\bar{A} \cdot \bar{C})$$

Question No.

Exercises

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