



Complete, fold and seal
(see note 2 below)

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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.

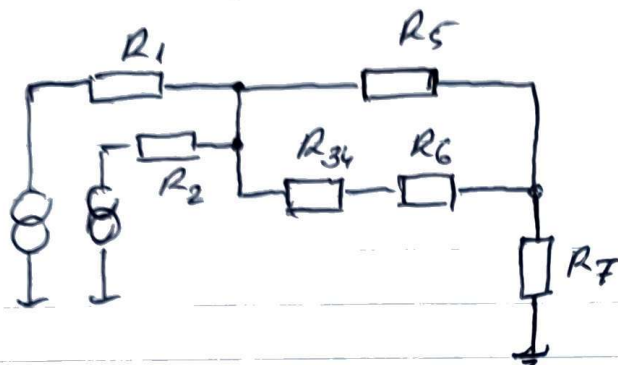
1	Student Number	KIS13818258
2	Title of Examination Paper	ELECTRICAL AND ELECTRONIC PRINC
3	Module Code	GOEE 4003
4	Date and Time of Examination	16.5.2022. AM
5	Examination Venue	W2
6	Seat Number	5
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
Q1	25
Q2	15
Q3	10
Q4	22
Total	72/100

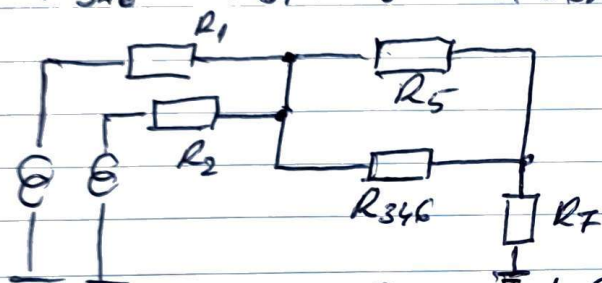
720/100
✓ K.G.F.

Q1. i,

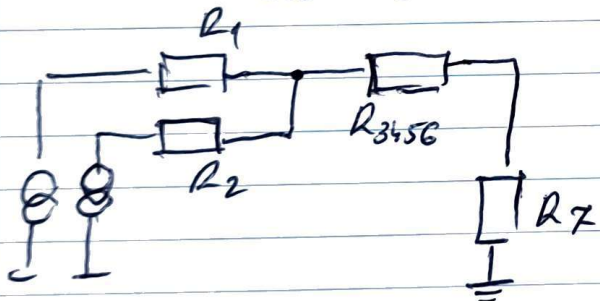
$$R_{34} = \frac{R_3 \times R_4}{R_3 + R_4} = \frac{8 \cdot 12}{8 + 12} = \frac{96}{20} = \underline{\underline{4.8 \Omega}} \quad \checkmark$$



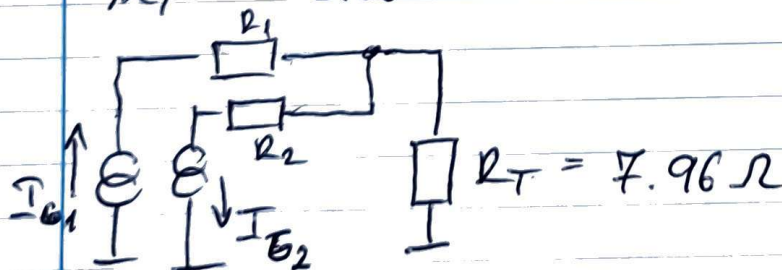
$$R_{346} = R_{34} + R_6 = 4.8 \Omega + 10 \Omega = \underline{\underline{14.8 \Omega}} \quad \checkmark$$



$$R_{3456} = \frac{R_{346} \times R_5}{R_{346} + R_5} = \frac{14.8 \Omega \cdot 10 \Omega}{14.8 \Omega + 10 \Omega} = \frac{148 \Omega}{24.8 \Omega} = \underline{\underline{5.96 \Omega}} \quad \checkmark$$



$$R_T = R_{3456} + R_7 = 5.96 \Omega + 2 \Omega = \underline{\underline{7.96 \Omega}} \quad \checkmark$$



$$I_T = I_{G1} - I_{B2} = 8 A - 5 A = \underline{\underline{3 A}} \quad \checkmark$$

$$ii, V_A = I_T \cdot R_T = 3 A \cdot 7.96 \Omega = \underline{\underline{23.88 V}} \quad \checkmark$$

iii, $P_L = V_A \cdot I_T = 23.88V \cdot 3A = \underline{\underline{71.64W}}$

iv, $I_1 = \frac{V_A}{R_5} = \frac{23.88V}{10\Omega} = 2.38A$

~~$I_2 = \frac{V_A}{R_{346}} = \frac{23.88V}{14.8\Omega}$~~

$3 = 10x + 14.8x$

$3 = 24.8x$

$x = 0.12$

$I_1 = R_5 \cdot x = \underline{\underline{1.2A}} = \underline{\underline{10 \cdot 0.12}}$

$I_2 = R_{346} \cdot x = \underline{\underline{1.77A}} = \underline{\underline{14.8 \cdot 0.12}}$

Q2.
i,

$$X_L = 2\pi \cdot f \cdot L = 2\pi \cdot 50\text{Hz} \cdot 0.3\text{H} = \underline{94.24 \Omega}$$

Q2

15/15

ii,

$$X_C = \frac{1}{2\pi \cdot f \cdot C} = \frac{1}{2\pi \cdot 50\text{Hz} \cdot 15\mu\text{F}} = \underline{212.2 \Omega}$$

iii,

$$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{50^2 + (94.24 - 212.2)^2}$$

-117.96

$$= \sqrt{2500 + 13914.56} = \sqrt{16414.56} = \underline{128.11 \Omega}$$

iv,

$$I_T = \frac{V_{cc}}{Z} = \frac{25\text{V}}{128.11 \Omega} = \underline{0.195 \text{ A}}$$

v,

$$\cos \phi = \frac{R}{Z} = \frac{50}{128.11} \Rightarrow \phi = \cos^{-1} \frac{50}{128.11} = \underline{67^\circ}$$

Q4. a,

$$i, V_{R_2} = \frac{R_2}{R_1 + R_2} \cdot V_{CC} = \frac{10k\Omega}{10k\Omega + 100k\Omega} \cdot 9V =$$

$$= \underline{0.81V} \quad \cancel{V_{BE}} \quad V_{BE} = V_{R_2} - 0.7V$$

$$V_{BE} \quad \cancel{V_{BE}} = \cancel{V_{R_2} - 0.7V} \quad \cancel{0.81V - 0.7V} = 0.1V \\ = V_{R_2} - 0.7V = 0.81V - 0.7V = \underline{0.1V}$$

$$ii, I_E \approx I_C = 1mA$$

$$V_C = R_C \cdot I_C = 3.9\Omega \cdot 0.001A = 3.9 \cdot 10^{-3}V$$

$$= \underline{3.9mV} \quad V_{CE} = V_{CC} - V_C = \underline{8.99V}$$

I THINK THE RC RESISTANCE
IS TOO LOW BEING 3.9Ω
SHOULD BE $3.9k\Omega$

IF $R_C = 3.9k\Omega$:

$$V_C = R_C \cdot I_C = 3.9k\Omega \cdot 0.001A = \underline{3.9V}$$

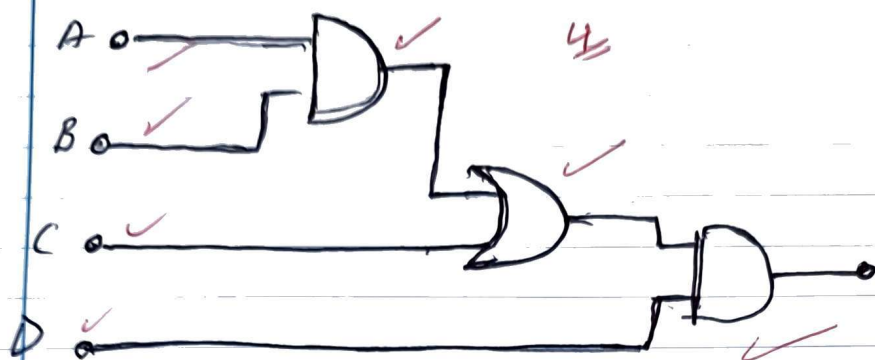
$$V_{CE} = V_{CC} - V_C = \underline{5.1V}$$

I THINK I_E NOT $1mA$
BECAUSE

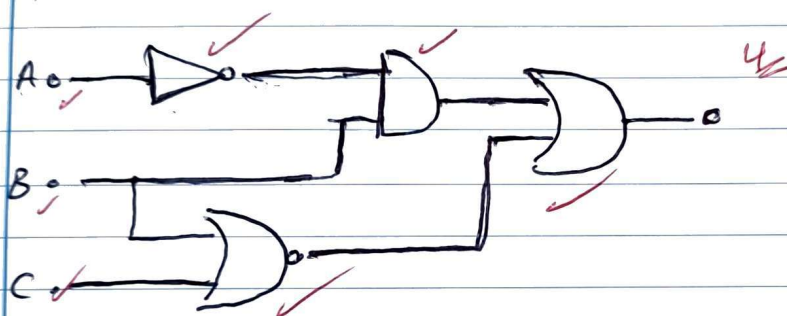
$$I_E = \frac{V_{BE}}{R_E} = \frac{0.1V}{1k\Omega} = \frac{0.1}{1000\Omega} = 0.1mA$$

b,

$$i, F = (A.B + C)B$$

Q4b
8/8

$$ii, F = (\bar{A}.B + (\bar{B} + C))$$



$$c, i, F = (A.\bar{B}) + C$$

Q4c
6/6

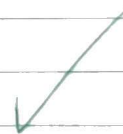
$$ii, F = ((\bar{B}.C) + B).A$$

$$d, Y = (\bar{A}.\bar{B})(\bar{A} + \bar{C})$$

$$Y = (\bar{A} + \bar{B})(\bar{A} + \bar{C}) \quad \times \quad 0$$

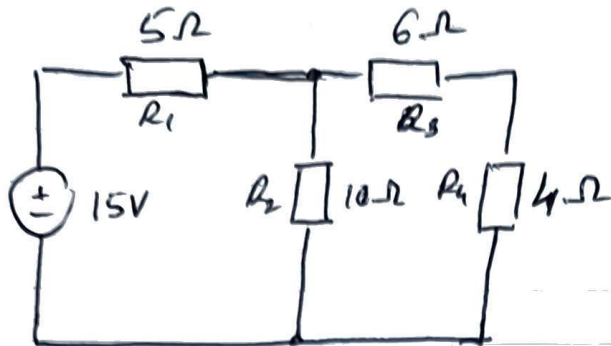
$$Y = (A + B)(A + C) \quad \times$$

Q4d

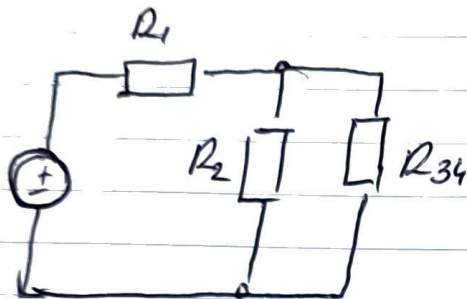
0/6

Q3a,

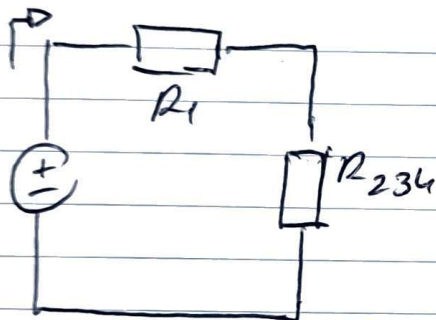
Circuit 1.



$$R_{34} = R_3 + R_4 = 6 + 4 = 10\Omega$$



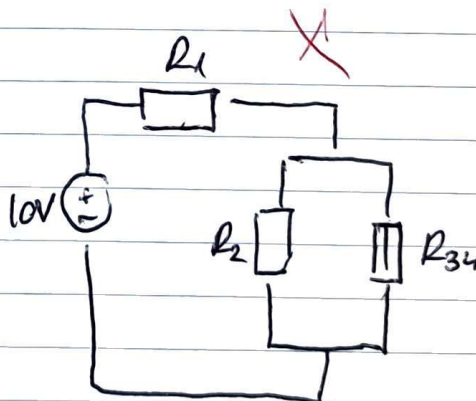
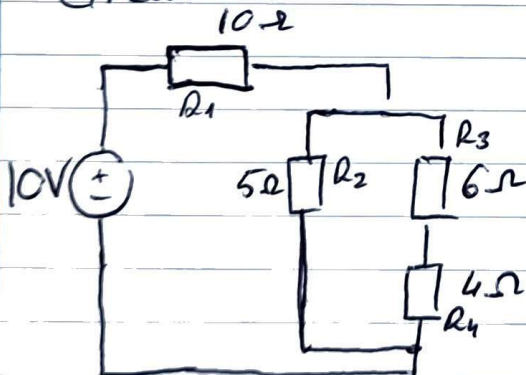
$$R_{234} = \frac{R_2 \cdot R_{34}}{R_2 + R_{34}} = \frac{10 \cdot 10}{10 + 10} = \frac{100}{20} = 5\Omega$$



$$R_T = R_1 + R_{234} = 5 + 5 = 10\Omega$$

$$I_T = \frac{V_T}{R_T} = \frac{15V}{10\Omega} = 1.5A$$

Circuit 2.



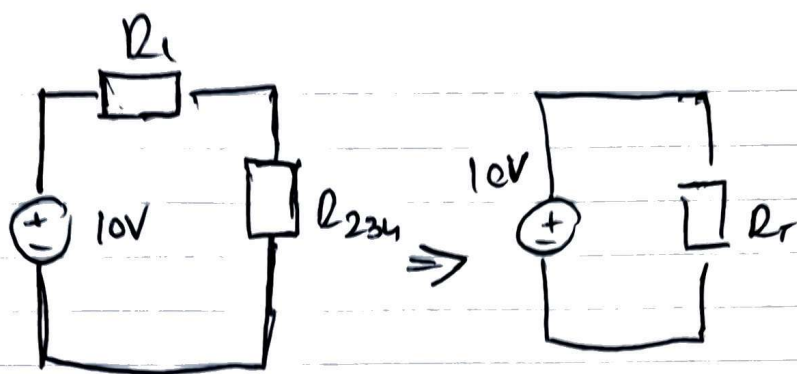
$$R_{34} = 6\Omega + 4\Omega = 10\Omega$$

$$R_{234} = \frac{R_2 \cdot R_{34}}{R_2 + R_{34}} = \frac{5 \cdot 10}{5 + 10} = \frac{50}{15} = 3.33\Omega$$

$$R_T = R_1 + R_{234} = 10\Omega + 3.33\Omega = 13.33\Omega$$

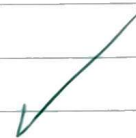
Q3a

15



$$I = \frac{V_{cc}}{R_T} = \frac{10V}{13.33 \Omega} = 0.75 A$$

X

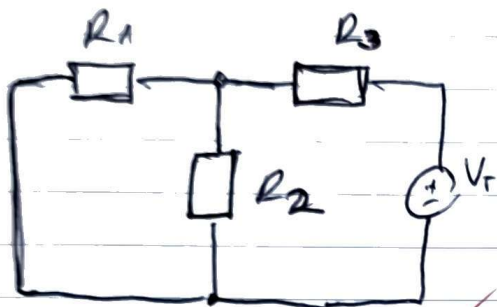


Q3. b,

$$V_T = \left(\frac{R_2}{R_2 + R_1} \right) \cdot V_S = \frac{6\Omega}{6\Omega + 4\Omega} \cdot 10V$$

$$= 0.6\Omega \cdot 10V = \underline{6V}$$

Thevenin circuit



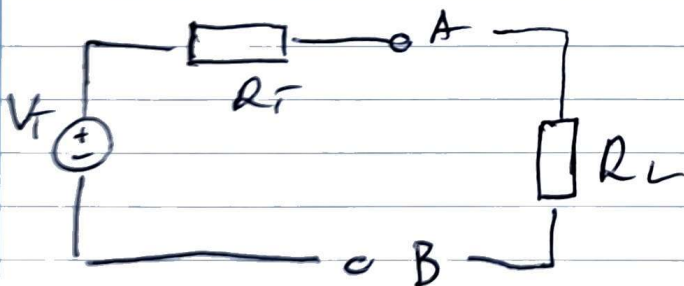
$$R_{12} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$$R_{12} = \frac{4 \cdot 6}{4 + 6} = \frac{24}{10} = \underline{2.4\Omega}$$

$$R_T = R_{12} + R_3 = 5.4\Omega$$

$$= 2.4\Omega + 3\Omega = \underline{5.4\Omega}$$

$$I_T = \frac{V_T}{R_T} = \frac{6V}{5.4\Omega} = \underline{1.11A}$$

ii, $P = \frac{V_T^2}{R_T}$ 

$$I_T = \frac{V_T}{R_T + R_L} = \frac{6V}{5.4\Omega + 4\Omega} = \underline{0.638A}$$

$$P = I_T \cdot V_T = 0.638A \cdot 6V = \underline{3.828W}$$

Q3b

10/15