UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2020/2021

COURSE NAME	:	PHYSICS III
COURSE CODE	:	DAS 24603
PROGRAMME CODE	:	DAU
EXAMINATION DATE	:	JANUARY / FEBRUARY 2021
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 In **Figure Q1**, a 20.0 V battery is connected across capacitors of capacitances $C_1 = C_6 = 3.5\ \mu F$ and $C_3 = C_5 = 5\ \mu F$ and $C_2 = C_4 = 4.7\ \mu F$. Calculate

(a) the equivalent capacitance C_{eq} of the capacitors

(12 marks)

(b) the charge stored in capacitor C_1.

(5 marks)

(c) the voltage drop across capacitor C_1.

(5 marks)

(d) the energy stored in capacitor C_1

(3 marks)

Q2 (a) Resistors $R_1 - R_7$ are connected to the terminals of a battery as in **Figure Q2 (a)**. Given the emf voltage is 15.0 V, internal resistance of the battery is 0.35 Ω, and $R_1 = R_2 = 60\ \Omega$, $R_3 = R_4 = R_5 = 120\ \Omega$, $R_6 = 70\ \Omega$, and $R_7 = 90\ \Omega$. Calculate:

(i) the equivalent resistance of the resistors.

(10 marks)

(ii) the current flow in the circuit.

(2 marks)

(b) For the circuit as in **Figure Q2 (b)**, given $R_1 = R_2 = R_3 = 1.2\ k\Omega$, $V_1 = 5$ V, $V_2 = 7.5$ V, and $V_3 = 3.5$ V. By applying Kirchoff's Current Law and Kirchoff's Voltage Law,

(i) re-draw the circuit and label the polarity of all electronic components.

(3 marks)

(ii) calculate the current I_1, I_2, and I_3 that flows in the circuit.

(10 marks)

Q3 An AC generator with amplitude emf of 220 V and operating at 360 Hz in a series RLC circuit. Given $R = 160\ \Omega$, $C = 29.5\ \mu F$, and $L = 199$ mH. Determine

(a) the impedance of the circuit.

(8 marks)

(b) the power factor and the phase difference of the circuit.

(5 marks)

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(c) the average power at which energy is dissipated in the resistance.

(6 marks)

(d) the new capacitance needed to maximize the average power if the other parameters of the circuit remain constant.

(4 marks)

(e) From your answer in **Q3 (b)**, conclude the relationship between the current and voltage in the RLC circuit.

(2 marks)

Q4 (a) **Figure Q4 (a)** shows a schematic diagram of a logic circuit.

(i) Write the logic statement of the logic circuit.

(4 marks)

(ii) From your answer in **Q4(a)(i)**, state the minimum number of NOT gates required to implement in the circuit.

(1 mark)

(b) A logic statement of a logic circuit is given by:

Y = 1 if (A is 1 AND B is NOT 1) AND (A is NOT 1 AND C is NOT 1) OR (B is 1 AND C is 1)

(i) Write the logic statement in terms of Boolean expression.

(2 marks)

(ii) Draw the logic circuit for the given logic statement.

(7 marks)

(iii) Complete the truth table as in **Figure Q4 (b)** for the given logic statement

(4 marks)

(iv) By using Boolean Algebra Laws, simplified the logic statement.

(5 marks)

(v) Draw the simplified logic circuit as in **Q4 (b) (iv)**.

(2 marks)

- END OF QUESTION-

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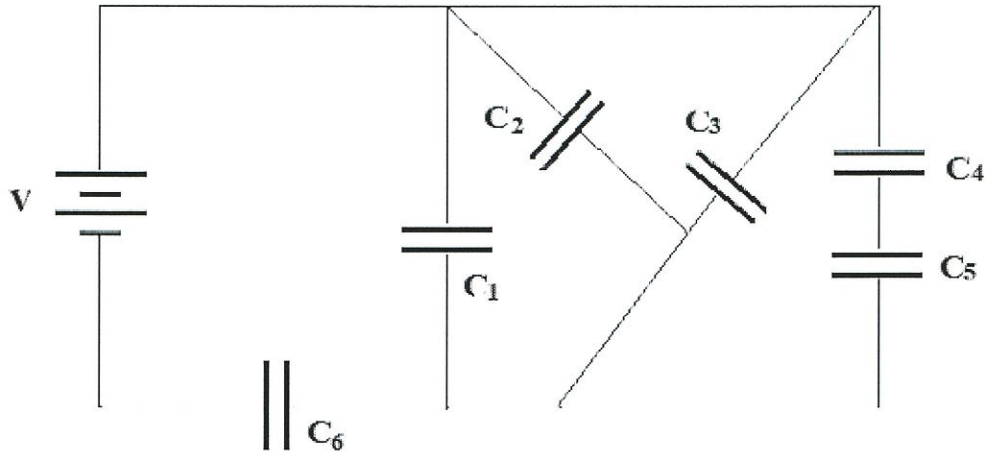

Figure Q1

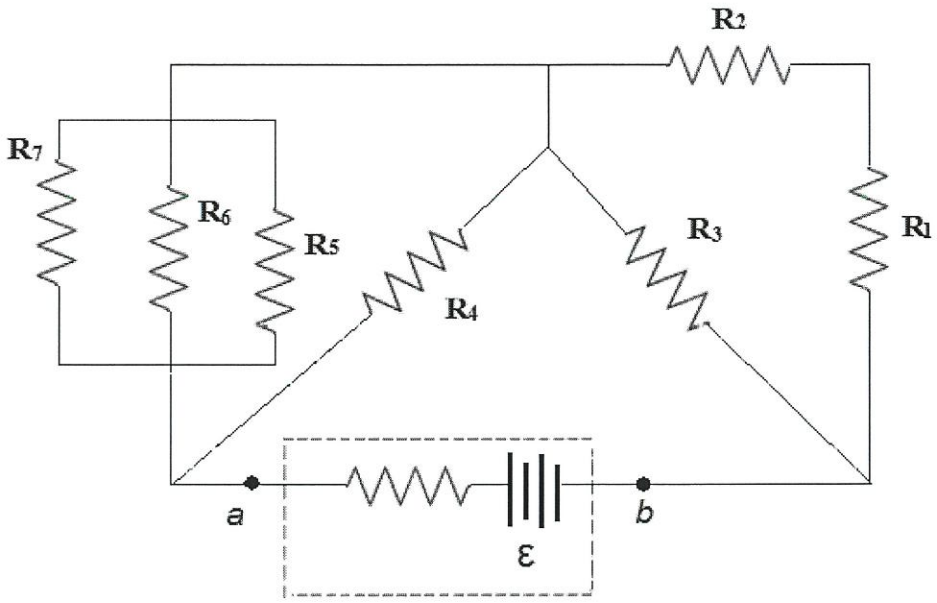

Figure Q2 (a)

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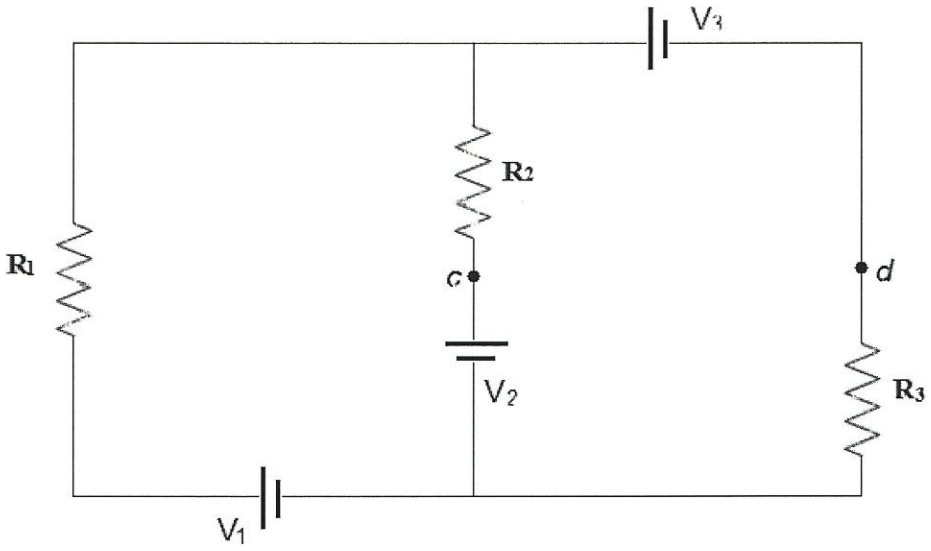

Figure Q2 (b)

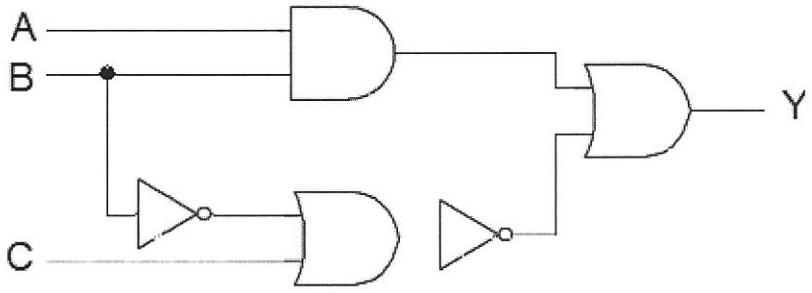

Figure Q4 (a)

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A	B	C	Y
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Figure Q4 (b)

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