Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	ELECTRIC AND ELECTRONIC TECHNOLOGY
COURSE CODE	:	BDA 14303
PROGRAMME CODE	:	BDD
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	PART A: ANSWER **ONE(1)** FROM **TWO(2)** QUESTIONS **ONLY** PART B: ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOURTEEN (14)** PAGES

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PART A: ANSWER **ONE(1)** FROM **TWO(2)** QUESTIONS **ONLY**

Q1 (a) Solve the value of v_1, i_1, v_2 and i_2 in the circuit of **Figure Q1(a).**

(Use A = your first two number of your identification number/ passport number and use B = your last two number of your identification number/ passport number).

(Use 10 if your number for A and B are 00).

(For example if your number is **99**1030-03-5**344** : A is 99 and B is 44)

(5 marks)

(b) A student sets up an electric circuit like the one shown in **Figure Q1(b)**.

i) Describe how a student would measure the current and voltage value for each component in the circuit in a laboratory.

(2 marks)

ii) By using nodal analysis method determine the value of current and voltage across the 4Ω resistor?

(4 marks)

iii) From the result obtained in **Q1(b)(ii)** please do explain why.

(4 marks)

(c) Using superposition theorem to determine the voltage Va in the network shown in **Figure Q1(c)**.

(10 marks)

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Q2 (a) Solve the value of I_1, I_2 and I_3 in the circuit of **Figure Q2(a).**
(Use A = your first two number of your identification number/ passport number and use B = your last two number of your identification number/ passport number. Use 10 if your number for A and B are 00).
(For example if your number is **99**1030-03-5**344** : A is 99 and B is 44)

(5 marks)

(b) A student sets up an electric circuit like the one shown in **Figure Q2(b)**.

i) Describe how a student would measure the current and voltage value for each component in the circuit in a laboratory.

(2 marks)

ii) By using mesh analysis method determine the value of current and voltage across the 10Ω resistor?

(4 marks)

iii) From the result obtained in **Q2(b)(ii)** please do explain why.

(4 marks)

(c) Find the resistor RL value that can provide maximum power transfer from the circuit shown in **Figure Q2(c)**.

(10 marks)

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PART B: ANSWER **ALL** QUESTIONS

Q3 (a) Calculate the current waveform, if the voltage across a 4μF is show in **Figure Q3(a)**.
X – The last two digit of your matrix number. (Use 10 if your number are 00).
(For example if your number is CD150072: X is 72)

(4 marks)

(b) Find the equivalent inductance of the circuit in **Figure Q3(b)**.

(4 marks)

(c) Solve the value of v_c, i_L and the energy stored in the capacitor and inductor in the circuit of **Figure Q3(c)** under dc condition.
(Use A = your first two number of your matric number and use B = your last two number of your matric number. Use 10 if your number for A and B are 00).
(For example if your number is CD150072: A is 15 and B is 72)

(7 marks)

(d) **Figure Q3(d)** shows that the switch in the circuit has been closed for a long time. It is opened at $t = 0$. Find the capacitor voltage, $V(t)$ for $t > 0$.

(10 marks)

Q4 (a) Calculate the rms value of waveform in **Figure Q4(a).**
X – The last digit of your matrix number. (Use 1 if your number are 0).
(For example if your number is CD150072: X is 2)

(5 marks)

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(b) A series RLC circuit with L =160 mH , C = 100 μF, and R = (X+10)Ω is connected to a sinusoidal voltage V (t) = (X+10)V sinωt , with ω = 200 rad/s.

X – The last digit of your matrix number. For example, a student with the matrix number CD150072 will have the values of X = 2, therefore X+10=12V.

i) Calculate the impedance of the circuit.

(5 marks)

ii) Let the current at any instant in the circuit be $I(t) = I_o \sin(\omega t - \varphi)$. Find I_o.

(2 marks)

iii) What is the phase φ?

(4 marks)

(c) Write down the equation for a sinusoidal voltage of 50 Hz and its peak value is 20 V. Draw the corresponding voltage versus time graph.

(5 marks)

(d) The equation for an alternating current is given by $i = 77 \sin 314t$. Find the peak value, frequency, time period and instantaneous value at t = 2 ms.

(4 marks)

Q5 (a) Explain the **three (3)** main differences between AC and DC motors?

(5 marks)

(b) An ideal transformer is rated at 2400/120V, 9.6kVa, and has 50 turns on the secondary side. Calculate:

i) The turn ratio

(2 marks)

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ii) The number of turn on the primary side

(2 marks)

iii) The current rating for primary and secondary winding

(2 marks)

(c) **Figure Q5(c)** shows a logic circuit which has three inputs A, B, C and two outputs F and G.

i) Obtain the logic expression for the outputs G and F.

(2 marks)

ii) Redesign the circuit using only 3-to-8 decoder (with active high outputs) and OR gates.

(6 marks)

(d) Find the Boolean expression for the Boolean function below by using Karnaugh Map.

$$F(W,X,Y,Z) = \sum m(0,1,2,4,5,6,8,9,12,13,14)$$

(6 marks)

-END OF QUESTIONS –

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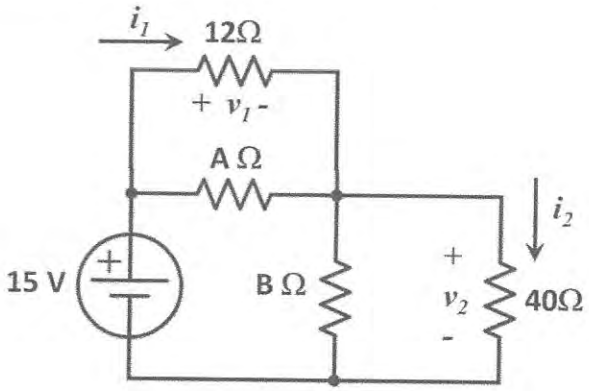

Figure Q1(a)

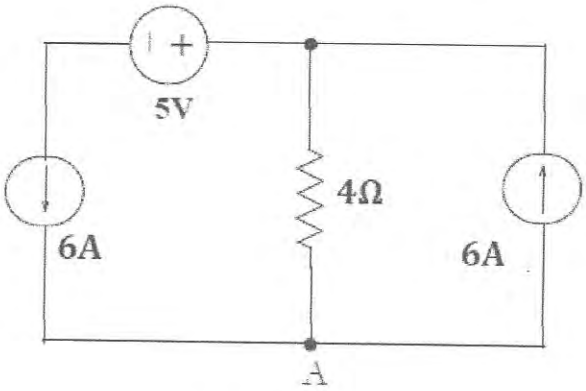

Figure Q1(b)

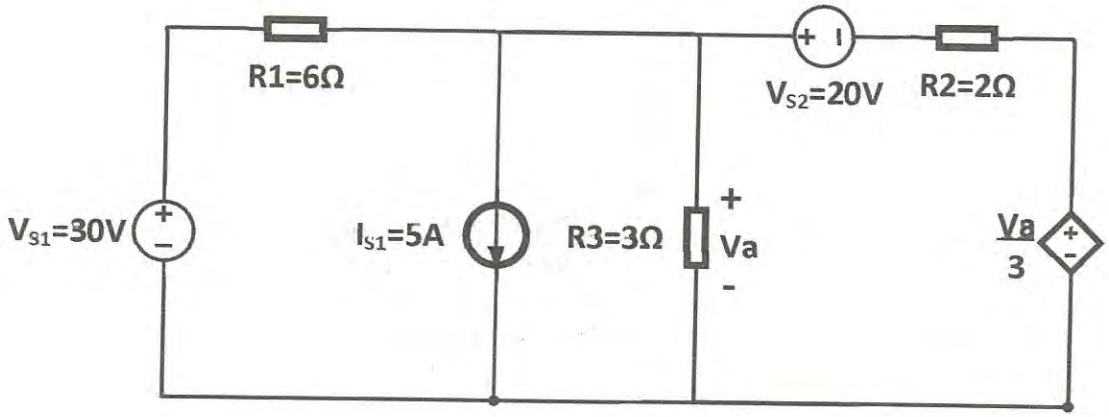

Figure Q1(c)

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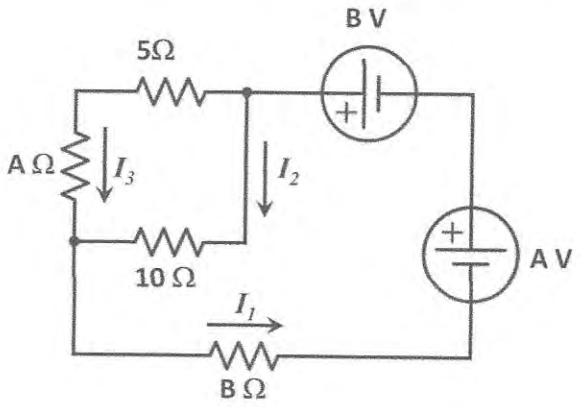

Figure Q2(a)

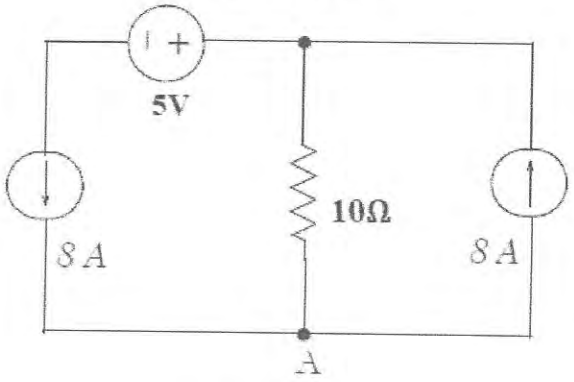

Figure Q2(b)

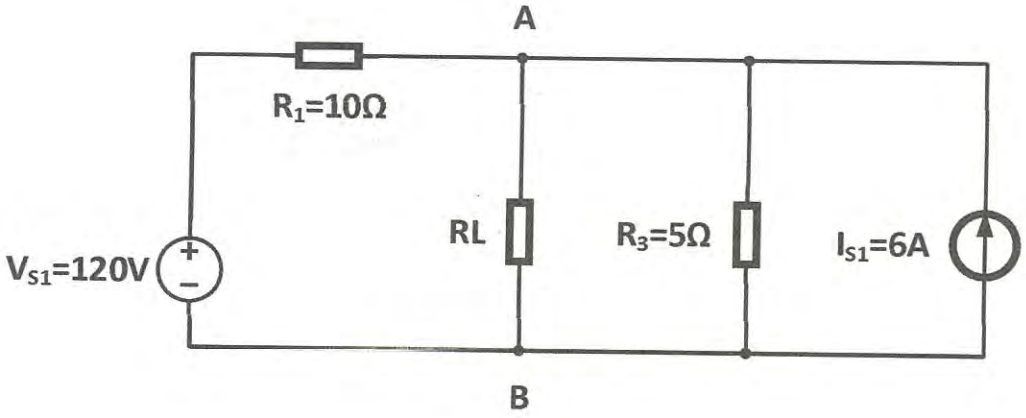

Figure Q2(c)

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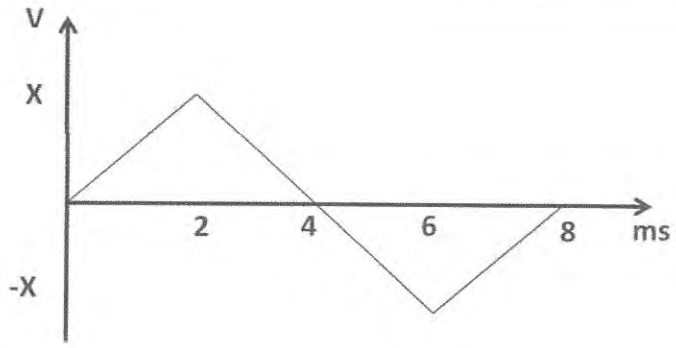

Figure Q3(a)

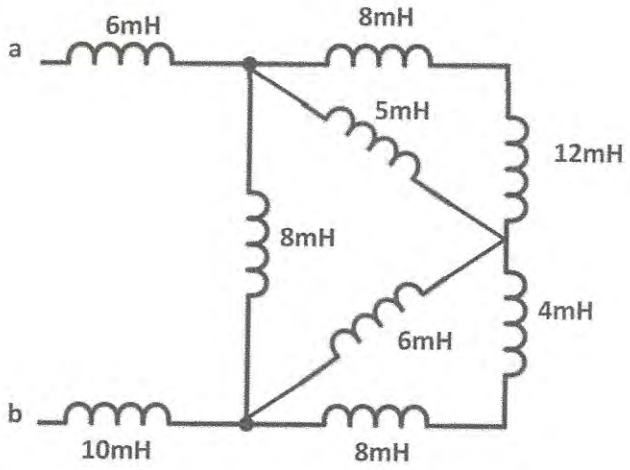

Figure Q3(b)

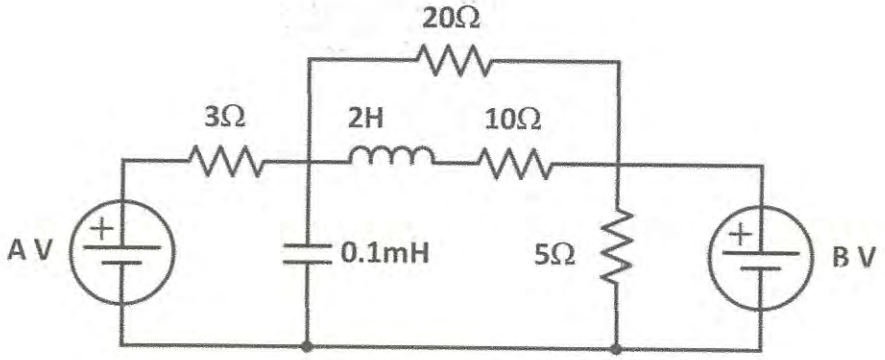

Figure Q3(c)

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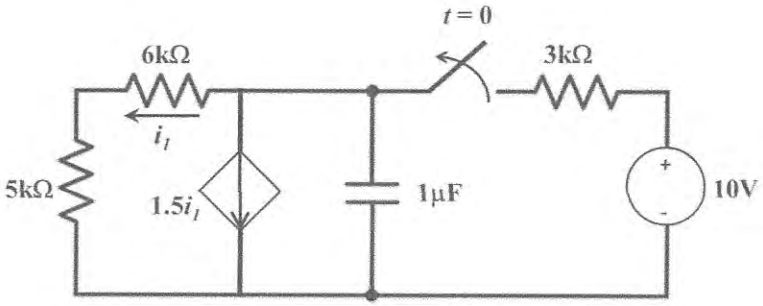

Figure Q3(d)

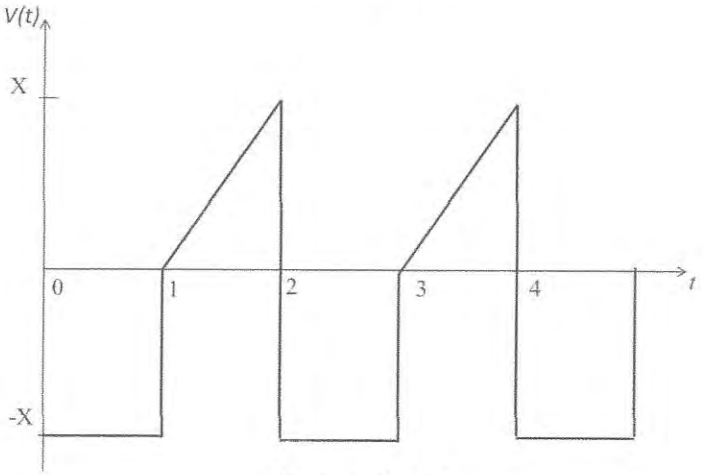

Figure Q4(a)

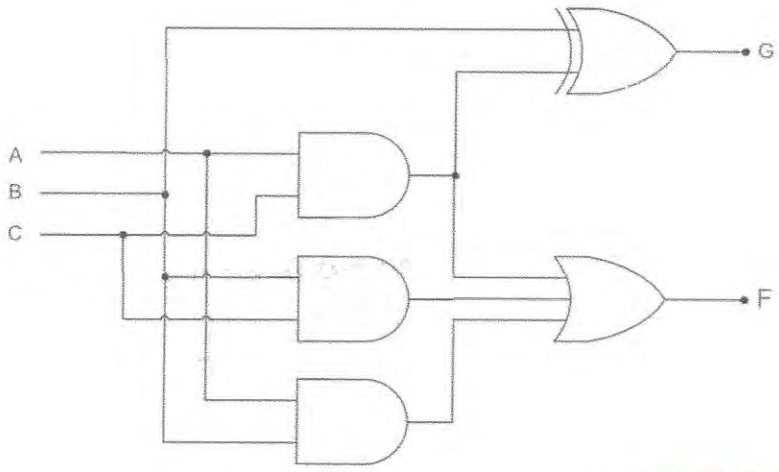

Figure Q5(c)

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LIST OF FORMULA

OHMS LAW

$$V = IR$$

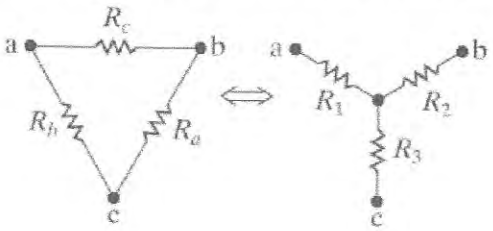
JOULE'S LAW

$$P = IV$$

KIRCHHOFF LAW

$$\sum_{k=1}^{n} i_k = 0 \qquad \sum_{v=1}^{n} v_k = 0$$

WYE-DELTA TRANSFORMATION

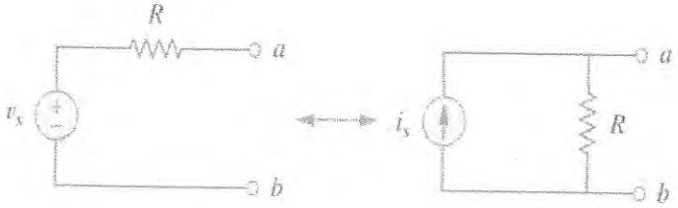


$$R_a = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_1} \qquad R_1 = \frac{R_bR_c}{R_a + R_b + R_c}$$

$$R_b = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_2} \qquad R_2 = \frac{R_cR_a}{R_a + R_b + R_c}$$

$$R_c = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_3} \qquad R_1 = \frac{R_aR_b}{R_a + R_b + R_c}$$

SOURCE TRANSFORMATION



$$V_S - I_sR$$

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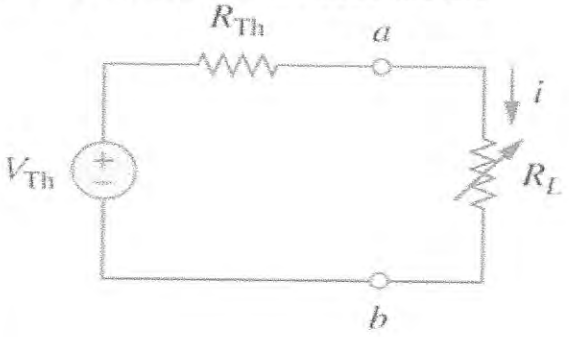
THEVENIN AND NORTON EQUIVALENT CIRCUIT

$$R_{TH} = R_N \qquad I_N = \frac{V_{TH}}{R_{TH}}$$

$$P = i^2 R_L = \left(\frac{V_{TH}}{R_{TH} + R_L} \right)^2 R_L \qquad \text{When } R_L \neq R_{TH}$$

$$P_{\max} = \frac{V_{TH}^{\ 2}}{4R_{TH}} \qquad \text{When } R_L = R_{TH}$$

MAXIMUM POWER TRANSFER



$$P = i^2 R_L = \left(\frac{V_{TH}}{R_{TH} + R_L} \right)^2 R_L$$

CAPACITOR AND INDUCTOR

$$C = \frac{\varepsilon A}{d} \qquad v(t) = \frac{1}{C} \int_{-\infty}^{t} i(t)dt + v(t_0)$$

$$i = C \frac{dv}{dt} \qquad w = \frac{1}{2} C v^2$$

$$L = \frac{N^2 \mu A}{l} \qquad v = L \frac{di}{dt}$$

$$i = \frac{1}{L} \int_{t_0}^{t} v(t)dt + i(t_0) \qquad w = \frac{1}{2} L i^2$$

$$\tau = RC \qquad \tau = \frac{L}{R}$$

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ALTERNATING CURRENT POWER CALCULATION

$$P(t) = v(t)i(t)$$ Instantaneous power

$$P = \frac{1}{2}\mathrm{Re}[VI^*] = \frac{1}{2}V_m I_m \cos(\theta_v - \theta_i)$$ Average power

$$i_{RMS} = \sqrt{\frac{1}{T}\int_0^T i^2 dt}$$

$$P_{RMS} = I_{RMS}{}^2 R = \frac{V_{RMS}{}^2}{R}$$

TRANSFORMERS

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$

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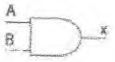
STANDARD RESISTOR VALUES AND COLOR

Color	Digit	Multiplier	Tolerance (%)
Black	0	10^0 (1)	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20

LOGIC GATES

Name	NOT	AND	NAND	OR	NOR	XOR	XNOR
Alg. Expr.	$\overline{A}$	AB	$\overline{AB}$	$A+B$	$\overline{A+B}$	$A \oplus B$	$\overline{A \oplus B}$
Symbol							
Truth Table	A X 0 1 1 0	B A X 0 0 0 0 1 0 1 0 0 1 1 1	B A X 0 0 1 0 1 1 1 0 1 1 1 0	B A X 0 0 0 0 1 1 1 0 1 1 1 1	B A X 0 0 1 0 1 0 1 0 0 1 1 0	B A X 0 0 0 0 1 1 1 0 1 1 1 0	B A X 0 0 1 0 1 0 1 0 0 1 1 1

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