Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	ELECTRICAL AND ELECTRONICS TECHNOLOGY
COURSE CODE	:	BDU 10803
PROGRAMME CODE	:	BDM
EXAMINATION DATE	:	JULY/AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.
		3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE FINAL EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

PART A: Answer **all** questions.

Q1 (a) State **three (3)** examples of passive components.

(3 marks)

(b) Define the term "supernode".

(2 marks)

(c) A circuit in **Figure Q1(c)** is supplied with 40 V voltage source. By transforming the arrangement of the resistors, find:

(i) the equivalent resistance.

(5 marks)

(ii) the current delivered by the voltage source.

(2 marks)

(iii) the power drain on the voltage source.

(2 marks)

(d) Consider the circuit shown in **Figure Q1(d)**. By using mesh-current method, determine:

(i) the mesh currents.

(6 marks)

(ii) the power associated with each voltage source.

(3 marks)

(iii) the voltage v_o across the 8Ω resistor.

(2 marks)

Q2 (a) State **four (4)** factors that can affect the value of inductance in a solenoid.

(4 marks)

(b) A circuit shown in **Figure Q2(b)** is connected to a 75 mA current source. Examine the circuit and determine:

(i) the Thevenin's voltage with respect to the terminals a,b.

(7 marks)

(ii) the Norton's equivalent circuit with respect to the terminals a,b.

(5 marks)

(c) A sinusoidal voltage is given by the expression $v = 300\cos(120\pi t + 30°)$. Calculate:

(i) The period of the voltage in milliseconds.

(2 marks)

(ii) The frequency in hertz

(2 marks)

(iii) The magnitude of v at $t = 2.778$ ms

(3 marks)

(iv) The rms value of v

(2 marks)

Q3 (a) Analyze the logic circuit in **Figure Q3(a)** and derive the Boolean expression for the intermediate and the final outputs.

(7 marks)

(b) Construct a truth table for the Boolean expression in **Q3(a)**.

(5 marks)

(c) Distinguish a single logic gate that can be applied to replace the entire circuit in **Figure Q3(a)**.

(2 marks)

(d) Recontruct the combinational logic circuit in **Figure Q3(a)** using only NAND gate.

(5 marks)

(e) Draw a logic gate circuit for this function:

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

(6 marks)

PART B: Answer **one (1)** question only.

Q4 (a) A bar magnet has two poles. Sketch the magnetic field pattern around the bar magnet and explain what the flux lines represent.

(6 marks)

(b) Discuss the difference between permanent magnet and electromagnet in terms of the following:

(i) production of magnetic field
(ii) strength of the magnetic field
(iii) control of the magnetic field

(6 marks)

(c) Describe **two (2)** ways to increase the strength of a magnetic field.

(4 marks)

(d) Draw the structure of a basic transformer and its symbol. Label the core, primary winding and secondary winding.

(5 marks)

(e) Differentiate the primary winding and the secondary winding of a transformer.

(4 marks)

Q5 (a) Differentiate generators and motors in terms of their energy conversion characteristics.

(2 marks)

(b) The basic parts of any DC machine are a stator and a rotor. Describe the behavior of each of them and what they are comprised of.

(6 marks)

(c) Explain **three (3)** advantages and disadvantages of a brushed DC motor.

(6 marks)

(d) Sketch the basic diode structure and symbol. Provide a proper labelling and explanation.

(5 marks)

(e) Describe **three (3)** types of diodes and their functions.

(6 marks)

– END OF QUESTIONS –

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023
COURSE NAME : ELECTRICAL AND ELECTRONIC TECHNOLOGY
PROGRAMME CODE: BDM
COURSE CODE: BDU10803

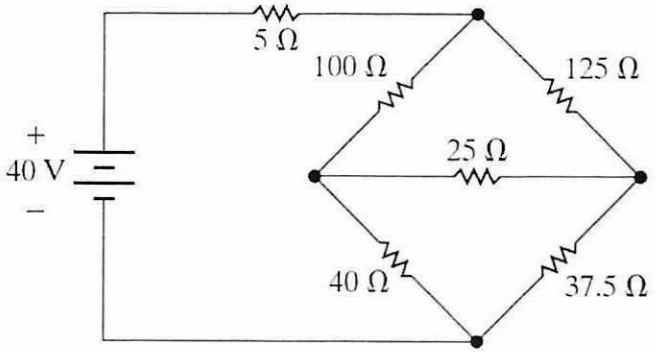


Figure Q1(c)

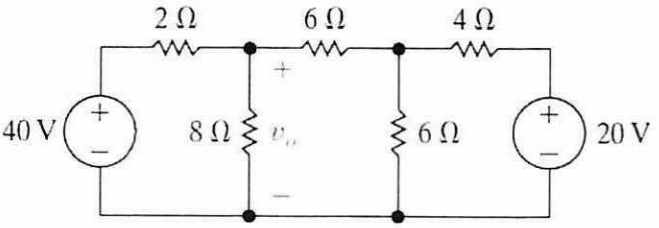


Figure Q1(d)

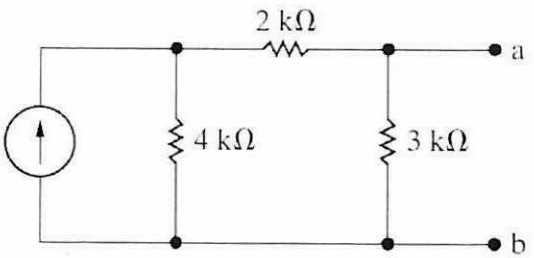


Figure Q2(b)

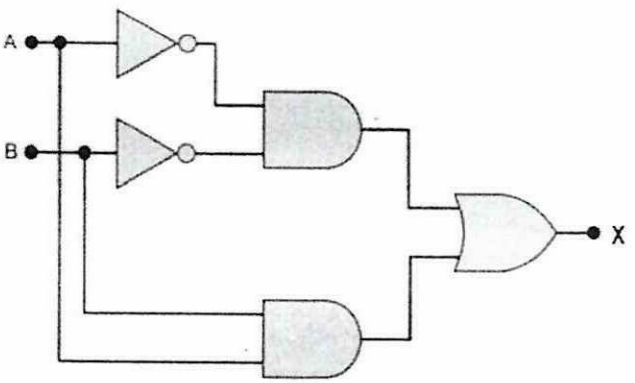


Figure Q3(b)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023
COURSE NAME : ELECTRICAL AND ELECTRONIC TECHNOLOGY
PROGRAMME CODE: BDM
COURSE CODE: BDU10803

LIST OF FORMULA

OHMS LAW

$$V = IR$$

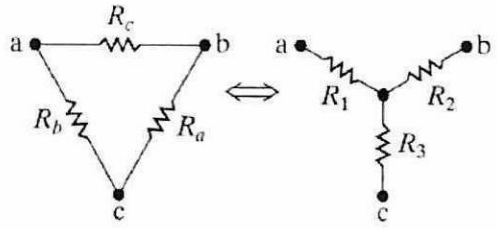
JOULE'S LAW

$$P = IV$$

KIRCHHOFF LAW

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

WYE-DELTA TRANSFORMATION

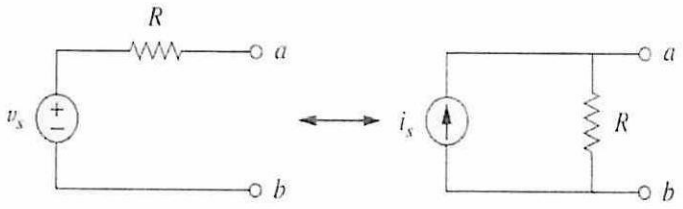


$$R_a = \frac{R_1R_2 + R_2R_3 + R_3R_1}{R_1} \qquad R_1 = \frac{R_bR_c}{R_a + R_b + R_c}$$

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

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

SOURCE TRANSFORMATION



$$V_S = I_sR$$

THEVENIN AND NORTON EQUIVALENT CIRCUIT

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

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

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

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023
COURSE NAME : ELECTRICAL AND ELECTRONIC TECHNOLOGY
PROGRAMME CODE: BDM
COURSE CODE: BDU10803

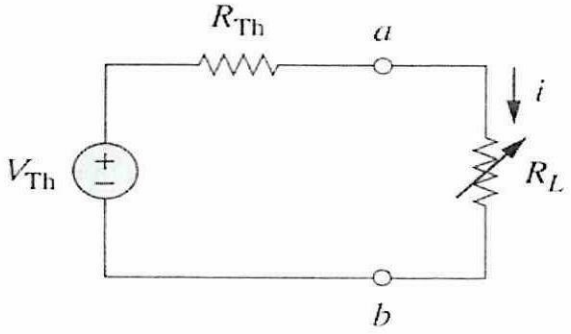
THEVENIN AND NORTON EQUIVALENT CIRCUIT

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

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

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

MAXIMUM POWER TRANSFER



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

CAPACITOR AND INDUCTOR

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

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

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

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

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

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023
COURSE NAME : ELECTRICAL AND ELECTRONIC TECHNOLOGY
PROGRAMME CODE: BDM
COURSE CODE: BDU10803

~~PHASOR RELATIONSHIP~~

$$v(t+T)=v(t)$$

$$f=\frac{1}{T}$$

$$z=x+jy=r\angle\phi=r(\cos\phi+j\sin\phi)$$

ALTERNATING CURRENT POWER CALCULATION

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

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

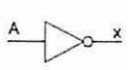
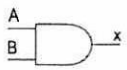
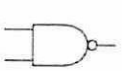
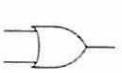
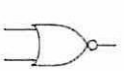
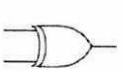
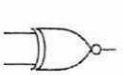
$$i_{RMS}=\sqrt{\frac{1}{T}\int_0^T i^2dt}$$

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

TRANSFORMERS

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

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