Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2023/2024

COURSE NAME	:	BASIC ELECTRIC & ELECTRONIC
COURSE CODE	:	DAM 13503
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	JANUARY / FEBRUARY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	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 EXAMINATION CONDUCTED VIA **CLOSED BOOK**

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Explain the difference between series circuit and parallel circuit.

(2 marks)

(b) Refer to **Figure Q1(b),** find,

(i) Total resistance R_T.

(4 marks)

(ii) Voltage drops across resistor label R_3 and R_6.

(4 marks)

(c) Refer to **Figure Q1(c)**. Given $V_A = 58V$, $V_B = 10V$, $R_1 = 4\Omega$, $R_3 = 3\Omega$, and $R_2 = 2\Omega$. By using node-voltage analysis, calculate,

(i) Voltage drops in resistor label R_1, R_2, and R_3.

(8 marks)

(iii) Current label I_1 and I_2.

(2 marks)

Q2 (a) List **Two (2)** factors to determine the amount of voltage induced by flux cutting the turn of coils.

(2 marks)

(b) A flux Φ of 45μWb in an area of 300 000 mm^2. Calculate the flux density (B) in,

(i) Gauss.

(2 marks)

(ii) Tesla.

(3 marks)

(c) A magnetic pole face has a rectangular section having dimension 200mm by 100mm. If the total flux emerging from the pole is 150 μWb, calculate the flux density.

(3 marks)

(d) Given flux density, B equal to 4T. When the area of flux is $0.0006m^2$. Find the flux exist.

(2 marks)

(e) An iron ring has a mean circumferential length of 0.5m and across sectional area of $1 \times 10^{-4}m^2$. It is wound uniformly with 600 turns of wire. Measurements made in a coil around the ring show that the current in the windings is 0.08A and the flux in the ring is 8×10^{-6} Wb. Find,

(i) Flux density, B.

(2 marks)

(ii) Field intensity, H

(2 marks)

(iii) Permeability, μ

(2 marks)

(iv) Relative permeability, μ_r

(2 marks)

Q3 (a) Capacitor stores energy in an electric field, with two terminals. Passive electronic component crucial for various applications in circuits.

(i) Create schematic diagrams illustrating the phases of charging and discharging a capacitor.

(3 marks)

(ii) Analyze and articulate the capacitor's functioning during these processes.

(3 marks)

(b) For a parallel capacitor circuit with capacitances of 10μF and 15μF,

(i) Calculate the total capacitance using appropriate formulae.

(2 marks)

(ii) Justify the computation of total charge stored when a voltage of 12V is applied.

(2 marks)

(iii) Evaluate the potential difference across each capacitor through appropriate analysis.

(3 marks)

(c) Within a series capacitor circuit featuring capacitances of 5μF and 8μF,

(i) Calculate the total capacitance using appropriate formulae.

(2 marks)

(ii) Assess the total energy stored when a voltage of 20V is applied.

(2 marks)

(iii) Justify how doubling the voltage across the circuit affects the stored energy.

(3 marks)

Q4 (a) Demonstrate the generation of alternating voltage in a coil within a generator and its representation as a sine wave voltage waveform.

(4 marks)

(b) In an alternating current circuit with resistance of 3000 ohm,

(i) Compute the Root Mean Square (RMS) values of voltage and current for a sine wave with a peak voltage of 220 V.

(3 marks)

(ii) Demonstrate the significance of frequency in an alternating current circuit and how changes in frequency affect the circuit's behavior.

(3 marks)

(c) Consider a motor operating on a 60-Hz AC power line,

(i) Demonstrate the impact of harmonic frequencies on the performance of the motor.

(3 marks)

(ii) Identify the role of phase angle in alternating current circuits.

(3 marks)

(d) Show the advantages and disadvantages of three-phase AC power in comparison to single-phase AC power.

(4 marks)

Q5 (a) Consider a transformer with a turns ratio of 2.5. If the primary impedance is 8 ohms,

(i) Calculate the transformed secondary impedance.

(1 mark)

(ii) Analyze the numerical result and the implications of impedance transformation in transformers.

(5 marks)

(b) Transformer transfers electric energy between AC circuits, either stepping up or down voltage, playing a vital role in electrical distribution.

(i) Calculate the mutual inductance if the primary coil has an inductance of 15 mH and the secondary coil has an inductance of 10 mH and k is the coefficient of coupling 0.93.

(2 marks)

(ii) Numerically demonstrate the significance of mutual inductance in transformers.

(4 marks)

(c) An inductor, also called a coil, choke, or reactor, is a passive two-terminal electrical component.

(i) Calculate the energy stored in the magnetic field of an inductor with an inductance of 6 H and a current of 2 A.

(1 mark)

(ii) Discuss the role of this stored energy in the operation of inductive components.

(3 marks)

(d) Explain core losses and different types of cores used in inductors.

(4 marks)

-END OF QUESTIONS –

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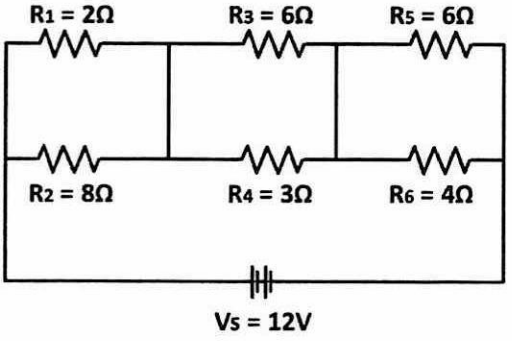

Figure Q1(b)

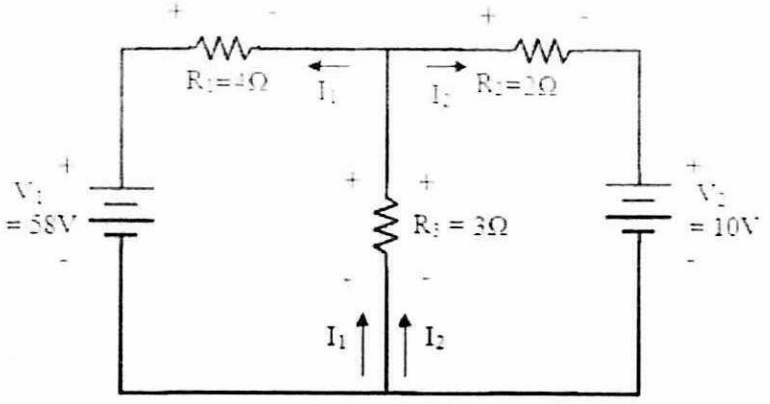

Figure Q1(c)