Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	ELECTRICAL TECHNOLOGY
COURSE CODE	:	DAE 11003
PROGRAMME CODE	:	DAE
EXAMINATION DATE	:	JANUARY / FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **FOUR (4)** QUESTIONS ONLY FROM **FIVE (5)** QUESTIONS PROVIDED. 2. *THIS FINAL EXAMINATION* IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSE BOOK.**

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES

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Q1 (a) Describe the relationship between protons and atomic number.

(2 Marks)

(b) Determine the minimum and maximum resistance value of a four (4) band resistor which has the first band - Green, the second band - Blue, the third band - Orange, the fourth band - Gold.

(3 Marks)

(c) Identify the color code of 33 kΩ, ±5% four (4) band resistor.

(4 Marks)

(d) Calculate resistor value that would produce a current flow of 5 Amps with a battery voltage of 12.6 volts.

(2 Marks)

(e) If the current through a circuit is 2 Amps and the resistance of a light bulb in the circuit is 10 Ohms, find the voltage difference across the light bulb and the power usage of the circuit.

(4 Marks)

(f) Referring to **Figure Q1(f),** sketch the connections of the ammeter and the voltmeter in measuring current and voltage across the load R1.

(2 Marks)

(g) Describe the linear relationship between current and voltage.

(2 Marks)

(h) Design an electric circuit schematic and illustrate the current flow direction for a DC lamp with a switch (Single Pole Single Throw -SPST) and a 9V battery.

(4 Marks)

(i) A battery is a type of voltage source that converts chemical energy into electrical energy. If the battery supplies 10 joules of energy per coulomb. Find the voltage of the battery.

(2 Marks)

Q2 (a) Express Kirchhoff's Voltage Law (KVL) equivalence for the circuit referring to **Figure Q2(a).**

(2 marks)

(b) Define the voltage divider in the series circuit.

(3 marks)

(c) Show the formula of the voltage divider for the circuit referring to **Figure Q2(c).**

(2 marks)

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(d) Consider a **three (3)** resistor in series (referring to **Figure Q2(d)**). Given, V1 = $0.2Vx$, V2 = $0.5Vx$ and R_T = 40 Ω. Obtain design values for:

(i) R1

(2 marks)

(ii) R2

(2 marks)

(iii) R3

(1 mark)

(e) Referring to **Figure Q2(e),** determine the following items when R2 = 19 kΩ, R3 = 30 kΩ and the Is = 8 mA.

(i) $R_{equivalent}$

(2.5 marks)

(ii) *V1*

(2 marks)

(iii) *I2*

(2 marks)

(iv) *I3*

(2 marks)

(v) Power supplied by the source

(1.5 marks)

(f) Summarize the total power obtained in series and parallel circuits.

(3 marks)

Q3 (a) Referring to **Figure Q3(a)**:

(i) Identify the bleeder current in **Figure Q3(a)**. Provide statement *and equivalent equation to support your answer.*

(3 Marks)

(ii) Find load currents at I_{RL1} and I_{RL2}

(8 Marks)

(iii) Determine value of bleeder current

(2 Marks)

(b) Based on **Figure Q3(b)**, define:

(i) Ohm's Law for Magnetic Circuits with aids of related equivalent.

(2 marks)

(ii) Magnetomotive force (m.m.f)

(2 marks)

(iii) Reluctance of the circuit if the flux is 834 μWb.

(2 marks)

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(c) (i) Explain the effect for material below on a magnetic field. Support your statement with related diagram.
(a) iron
(b) wood

(4 marks)

(ii) Illustrate the north and south poles of the magnet.

(2 marks)

Q4. (a) (i) Define *'Period'* of a sine wave.

(1 mark)

(ii) Illustrate 5 cycles of sine wave.

(2 marks)

(b) Convert the following angular values from degrees to radians:
(i) 45^0

(2 marks)

(ii) 200^0

(2 marks)

(c) A sine wave has a peak value of 20V. Determine the following values:
(i) V_{rms}

(2 marks)

(ii) V_{pp}

(2 marks)

(iii) $V_{avg\ (over\ a\ half\ cycle)}$

(2 marks)

(d) Solve the following operations:
(i) $\dfrac{2.5\angle 65° - 1.8\angle -23°}{1.2\angle 37°}$ (4 marks)

(ii) $\dfrac{(100\angle 15°)(85 - j150)}{25 + j45}$ (3 marks)

(e) Design a simple AC generator complete with magnetic poles, anchor, load, carbon brushes and slip rings.

(5 marks)

Q5 (a) Define:
(i) *Primary winding*

(1 mark)

(ii) *Secondary winding.*

(1 mark)

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(b) Identify **three (3)** types of self-excited DC generators.

(3 marks)

(c) Determine the maximum power that can be delivered to the 10Ω speaker referring to **Figure Q5(C)**.

(12 marks)

(d) Identify the parts labelled as i, ii, iii, iv and v of a DC machines referring to **Figure Q5(d)**.

(5 marks)

(e) Construct *Short Shunt Compound Wound DC Generator* circuit.

(3 marks)

-END OF QUESTIONS –

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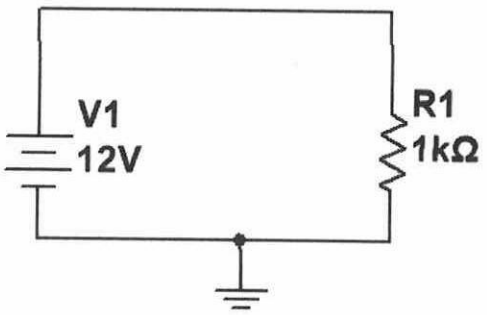

Figure Q1(f)

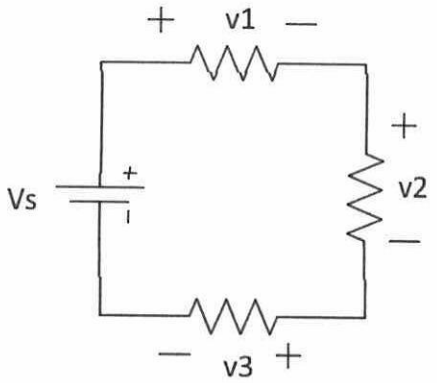

Figure Q2(a)

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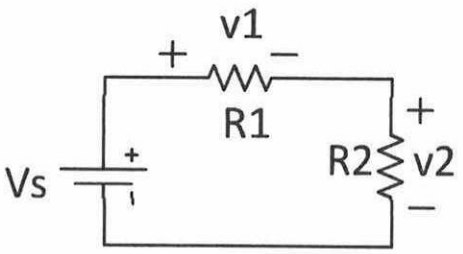

Figure Q2(c)

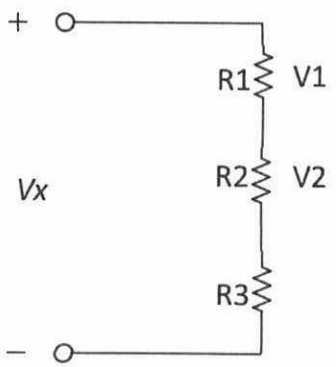

Figure Q2(d)

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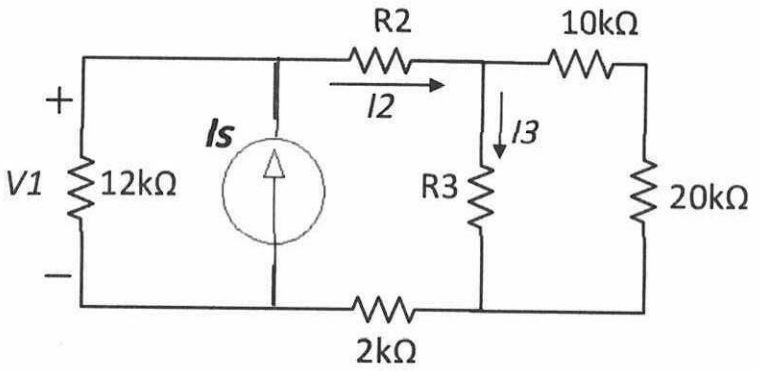

Figure Q2(e)

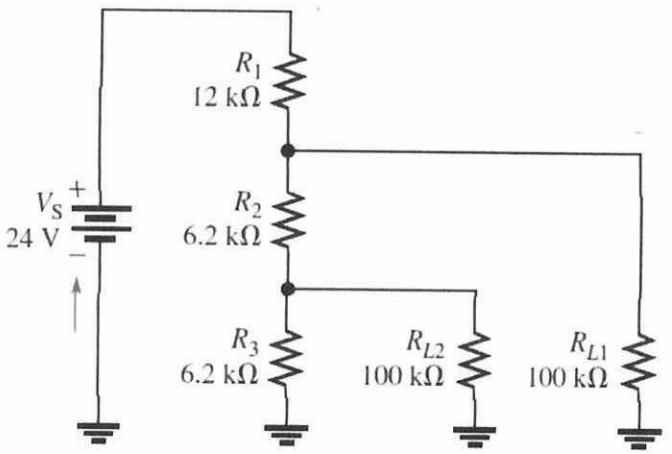

Figure Q3(a)

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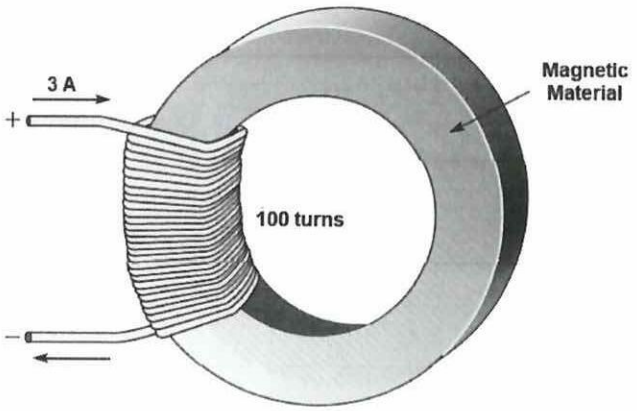

Figure Q3(b)

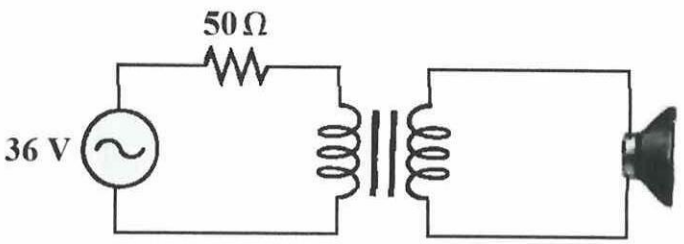

Figure Q5(c)

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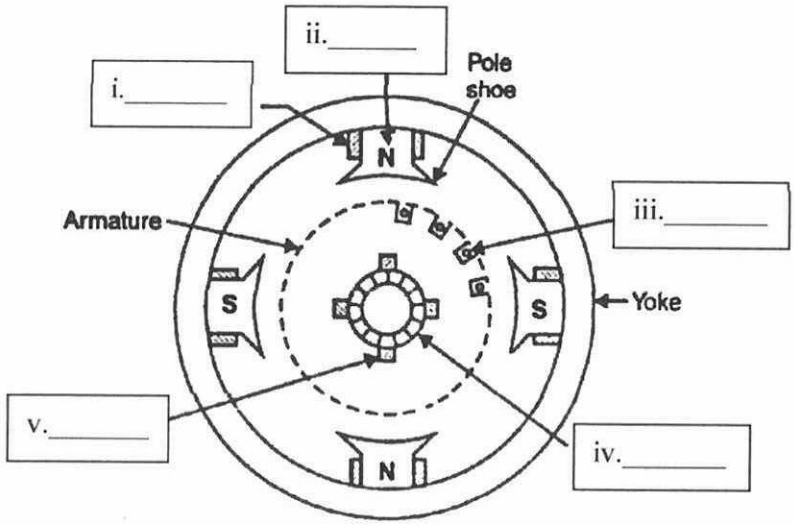

Figure Q5(d)

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