W/D/TY

Reg. No: [redacted]

VIT (10)
Vellore Institute of Technology

Final Assessment Test – April 2025

Course: BEEE102L - Basic Electrical and Electronics Engineering
Class NBR(s): 4465 / 4498 / 4499 / 4507 / 4509 / 4526 Slot: B1+TB1
Time: Three Hours Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions
(10 X 10 = 100 Marks)

1. Find the voltages at nodes A, B and C with respect to the reference node for the circuit depicted in Figure 1. Identify the resistor consuming the maximum amount of power.

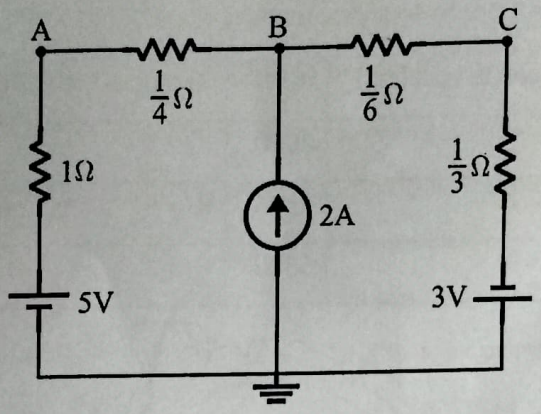

Figure 1

2. For the resistive network depicted in Figure 2, compute the equivalent resistance R_{AB}.

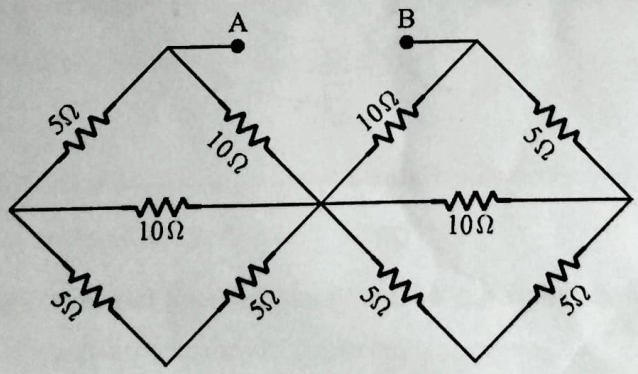

Figure 2

3. A sinusoidal voltage source of amplitude 100 V is connected to a series RLC circuit having R = 50Ω, L = $\frac{1}{4\pi}$ H and C = $\frac{1}{\pi}$ F.

Compute the maximum possible power dissipation in the resistor and the frequency at which it occurs assuming sinusoidal steady state conditions.

4. Three generators, each possessing 100 V_{RMS} as its terminal voltage, forms a balanced 3 phase delta connected source with phase sequence ABC, supplying a balanced delta connected load of (3+4j) Ω per phase. Determine

i) The individual phase currents

ii) The individual line currents

iii) The 3-phase real power and the 3-phase apparent power

5.a) Three concentric toroidal pieces are arranged as depicted in Figure 3. Each toroidal piece has different material, mean length and cross sectional area. The setup is wrapped by 200 turns of wire through which a current of 5A flows.

Given the flux is 13.5176 mWb, find the length l_2 of material 2.

Relevant data:

Toroidal segment	Mean length (cm)	μ_r	Radius of cross section (cm)
Thinnest (1)	$l_1 = 5$	2000	$R_1 = 1$
Thickest (2)	$l_2 = ?$	1500	$R_2 = 5$
Middle (3)	$l_3 = 9$	6500	$R_3 = 3$

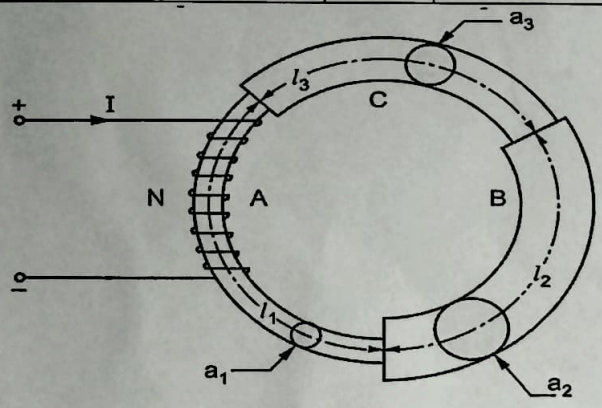

Figure 3

OR

5.b) Find the equivalent inductance L_{AB} of the circuit depicted in Figure 4 provided ω=1rad/s.

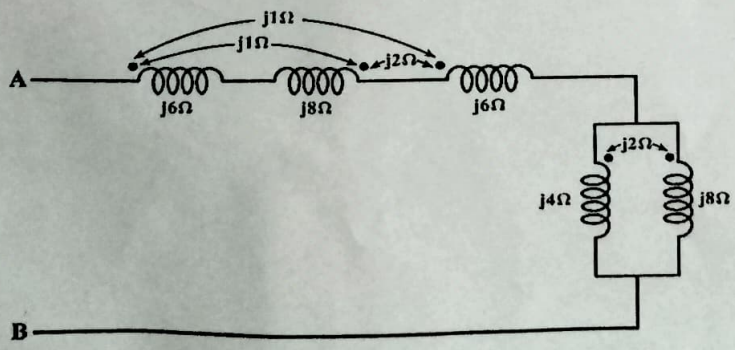

Figure 4

6. Complete the given table by finding out the missing terms.

Decimal	Binary	Octal	Hex
		123.1	
13.25			
		252.04	AA.1

7. Construct a 4-input (A,B,C and D) logic circuit employing only a minimum number of NAND gates which implements the following conditions:

   i) The output has to be HIGH (1) when all inputs are low (0).

   ii) The output has to be HIGH (1) when only one of the 4 inputs is HIGH (1).

   iii) For all other cases, the output has to be low (0).

8. a) For an ideal transformer fed by a sinusoidal voltage, prove that the ratio of the primary to secondary voltage is equal to the ratio of the number of coil turns in the primary to the number of coil turns in the secondary. **[4]**

   b) Consider an ideal transformer fed by a sinusoidal source of 110 V_{RMS} and 60 Hz (in the primary). The ratio of number of turns in primary to that of the secondary is 5:1. A load of 10 Ω resistor is connected at the secondary. Determine the RMS values voltage at the secondary and the current in the primary. **[6]**

9.a) State Fleming's left hand rule and with a simple schematic, explain how this law governs the motoring action in a DC machine.

OR

9.b) Describe briefly the construction of a 3-phase induction motor and the principle of operation. State some of its applications.

10. Draw the circuit to obtain the characteristics of the BJT under common emitter configuration and explain the resulting characteristic curves.

⇔⇔⇔ **W/D/TY** ⇔⇔⇔