

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) EXAMINATION – WINTER 2023

Subject Code:3132406

Date:18-01-2024

Subject Name:Circuit Theory

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define with respect to electric circuit & network: (i) Junction (Principal node) (ii) Node Voltage (iii) Graph.	03
	(b) State and explain Kirchhoff's Voltage law & Kirchhoff's Current law.	04
	(c) Discuss concept of duality and dual networks.	07
Q.2	(a) Define: (i) 1-Volt (ii) 1-Henry (iii) 1-Farad	03
	(b) What are the network elements and how it responds when electric energy supplied? Write the relationship between voltage and current in resistor, inductor and capacitor.	04
	(c) Explain maximum power transfer theorem with the help of circuit network. Derive the equation of maximum power for AC circuits. Also give the condition for maximum power transfer.	07
	OR	
	(c) Explain Superposition theorem for AC Networks with the help of neat and clean circuit network.	07
Q.3	(a) Write the initial and final condition for R, L & C components in the different cases.	03
	(b) In the circuit as shown in Fig. (1), find the current in 1Ω resistor. Apply nodal voltage method.	04
	(c) Determine the node voltages and the current through the resistors using mesh methods for the network shown in Fig. (2).	07
	OR	
Q.3	(a) Enlist the advantages from understanding of initial conditions results.	03
	(b) Write and explain Thevenin Theorem.	04
	(c) Write short notes on poles and zeros of network functions.	07
Q.4	(a) Derive z- parameters in terms of y-parameters.	03
	(b) If $e_1 = e_2 = e_3 = 1V$ and all the resistances are of 1Ω . Obtain the mesh equations and loop currents for the network given in Fig. (3).	04
	(c) Discuss frequency response of series resonance and parallel resonance.	07
	OR	
Q.4	(a) Derive y- parameters in terms of z-parameters.	03
	(b) Find (V_2 / V_1) using mesh method for the given network in Fig. (4).	04
	(c) List the steps for analysis of network using Laplace Transformation Method.	07

- Q.5 (a)** Discuss relationship of two port variables. **03**
- (b)** Obtain the Norton equivalent circuit with respect to terminal AB for circuit in Fig. (5). **04**
- (c)** In the given network Fig. (6), switch k is closed in position-1 at time $t = 0$, thereby applying 100V source to RL circuit and at $t = 500 \mu\text{sec}$ switch is moved to position-2. Apply first order differential equation and obtain the expression for the current in both intervals and sketch transient. **07**
- OR**
- Q.5 (a)** Discuss interconnections of two port networks. **03**
- (b)** Find the Thevenin equivalent circuit for the network shown in Fig. (7). **04**
- (c)** In the circuit shown in Fig. (8) switch k is closed on position-1 at $t = 0$ and change over to position-2 after 1msec. Using first order differential equation find the time at which current is zero and reversing its direction. **07**

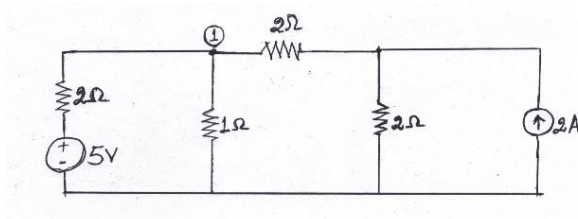


Fig. (1) Q 3 (b)

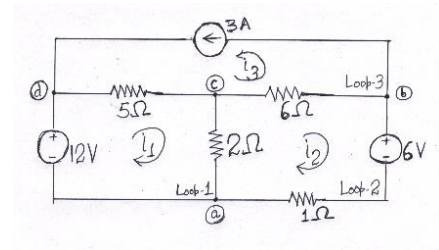


Fig. (2) Q 3 (c)

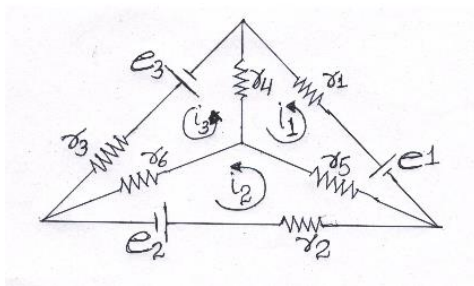


Fig. (3) Q 4 (b)

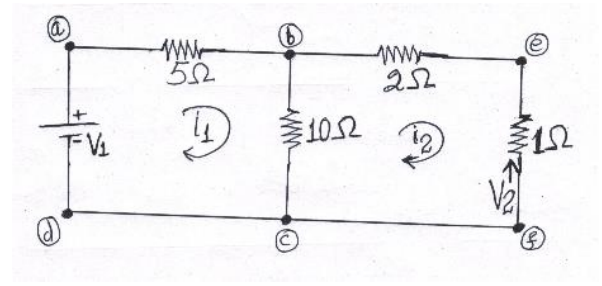


Fig. (4) OR Q 4 (b)

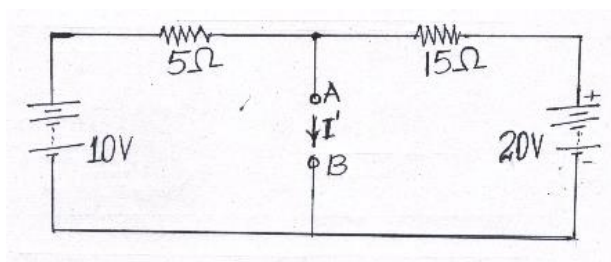


Fig. (5) Q 5 (b)

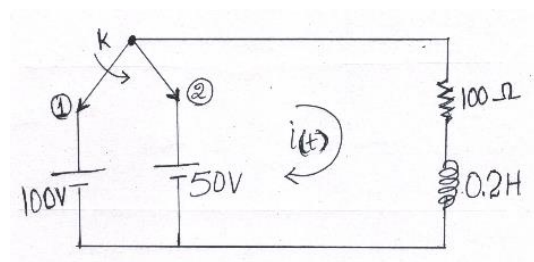


Fig. (6) Q 5 (c)

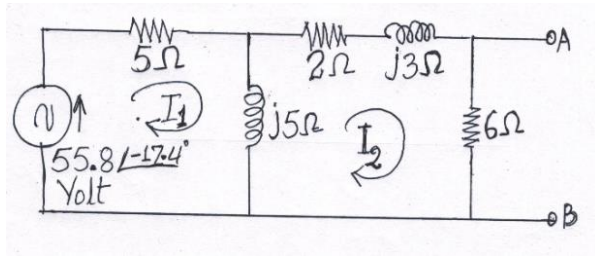


Fig. (7) OR Q 5 (b)

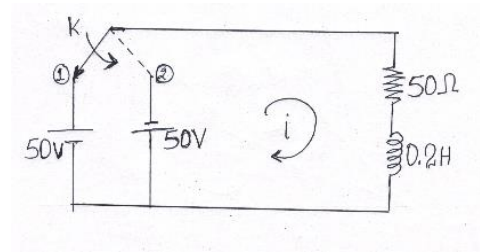


Fig. (8) OR Q 5 (c)