Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III EXAMINATION – WINTER 2025

Subject Code:3131103 Date:22-12-2025

Subject Name: Network 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)**	State and explain superposition's theorem.	**03**
	(b)	Derive the condition for network to be reciprocal for y-parameters.	**04**
	(c)	Determine the power delivered by the voltage source for the circuit shown in fig.1	**07**
Q.2	**(a)**	Determine the Laplace transform of $f(t)= e^{5t}\sin 8t$.	**03**
	(b)	Write a short note on Dot Convention.	**04**
	(c)	Derive relationship between incidence matrix and fundamental cut-set matrix.	**07**
		OR	
	(c)	Find the current in 10ohm resistor in the network of Fig.2 using Thevenin's theorem. Resistances are in ohms.	**07**
Q.3	**(a)**	Explain initial value theorem of Laplace transform.	**03**
	(b)	Explain and derive the step response to R-L series circuit using Laplace Transformation method.	**04**
	(c)	In the network of Fig.3, a steady state is reached with the switch k open. At t=0, the switch is closed. For the elements given, determine values of $V_a(0-)$ and $V_a(0+)$.	**07**
		OR	
Q.3	**(a)**	Explain final value theorem of Laplace transform.	**03**
	(b)	Explain and derive the step response to R-C series circuit using Laplace Transformation method.	**04**
	(c)	In the network of Fig.4, the switch k is closed at t=0. Find the particular solution for the current.	**07**
Q.4	**(a)**	Explain characteristic of an ideal current source.	**03**
	(b)	Briefly explain Positive Real Function (PRF).	**04**
	(c)	In the circuit shown in Fig.5, switch k is closed on position 1 at t=0, and then moved to position 2 after 0.5ms. Obtain the equations for the current in both intervals.	**07**
		OR	
Q.4	**(a)**	Explain characteristic of an ideal voltage source.	**03**
	(b)	Explain following terms: (a) Tree (b) Mesh (c) Subgraph d) Planar Graph.	**04**
	(c)	Obtain required condition for ABCD parameters to be reciprocal and symmetrical.	**07**
Q.5	**(a)**	Write a short note on Source Transformation.	**03**
	(b)	Write a short note on Inverse Hybrid Parameters.	**04**
	(c)	Obtain Z parameters for the network shown in Fig.6	**07**
		OR	
Q.5	**(a)**	What is network synthesis?	**03**
	(b)	Derive formulae to convert given y – parameters into z - parameters.	**04**
	(c)	Find Norton's equivalent network across terminals AB of the network shown in Fig. 7	**07**

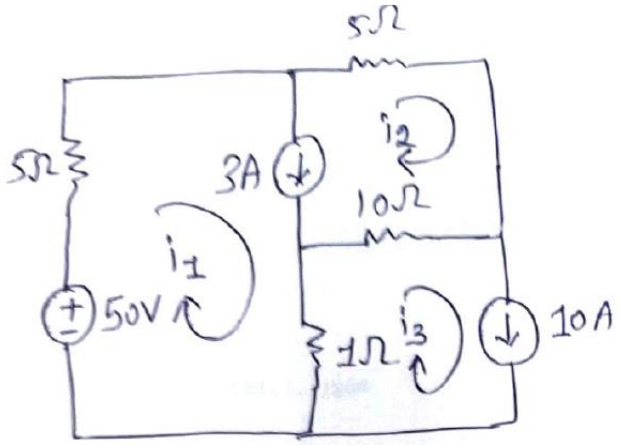

Fig 1.

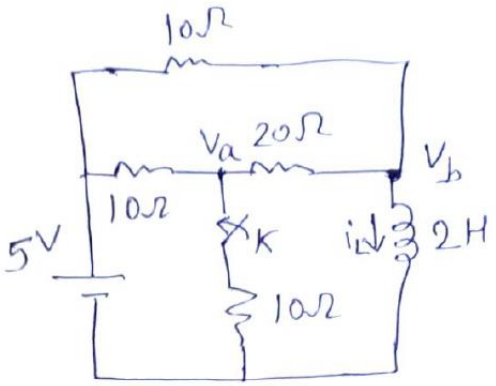

Fig 3

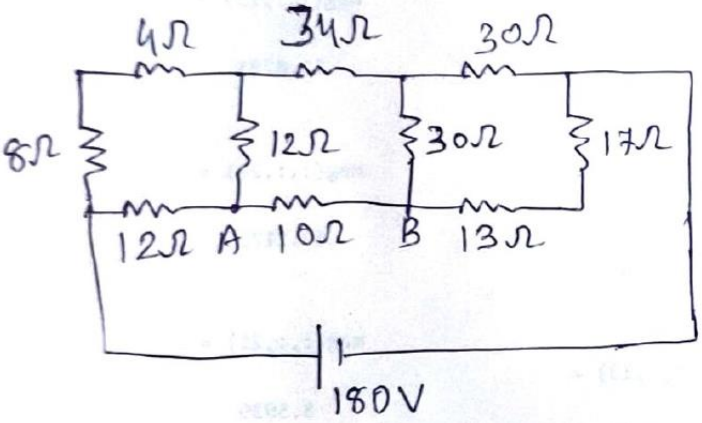

Fig 2.

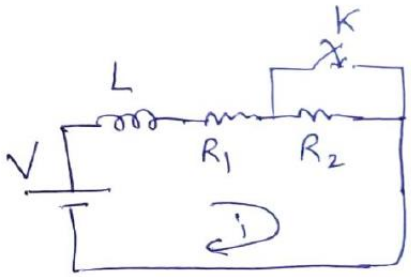

Fig 4

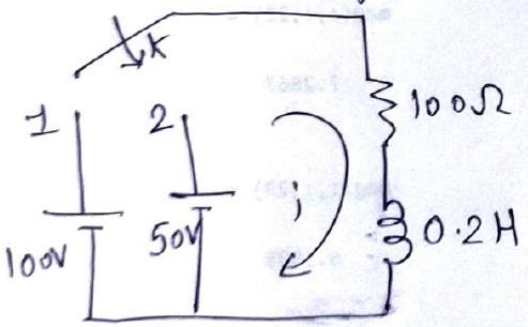

Fig 5

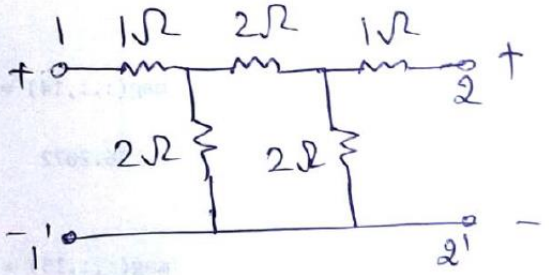

Fig 6

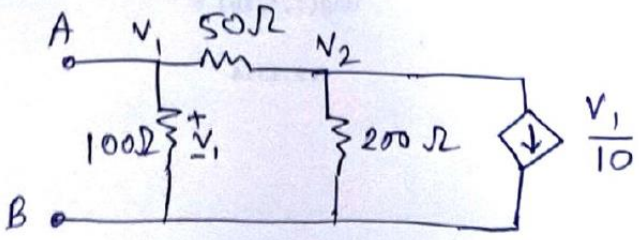

Fig 7

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