Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2024

Subject Code: 3131103 Date:10-12-2024

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)**	Define (1) Tie set (2) Cut set (3) Incident Matrix	**03**
	(b)	Discuss why (a)The current in inductor cannot change instantaneously (b)The voltage across capacitor cannot change instantaneously.	**04**
	(c)	In the network of fig 1, use node analysis to determine i_x.	**07**
Q.2	**(a)**	State and Explain Reciprocity theorem.	**03**
	(b)	State and Explain initial value and final value theorem with suitable example.	**04**
	(c)	Use superposition theorem to find to value of 'v' across 20Ω resistor in the network of fig 2.	**07**
		OR	
	(c)	Find the current in 10Ω resistor in the network of fig 3 using Thevenin's theorem. Resistances are in ohms.	**07**
Q.3	**(a)**	What is time constant? What is its significance? Illustrate through an example.	**03**
	(b)	In the network of fig 4, the switch k is closed at t=0, a steady state having previously been attained. Find the particular solution for the current.	**04**
	(c)	Find a network of fig 5, switch k is opened at t=0. Determine the particular solution for v(t).	**07**
		OR	
Q.3	**(a)**	What is equivalent circuit of the charged and uncharged inductor and capacitor at t=0+ and t=∞.	**03**
	(b)	In a series R-L-C network of fig 6, switch k is closed at time t=0. Determine the particular solution of i(t) for the element values given : V=10V, R=2Ω, L=1H, C=0.2F.	**04**
	(c)	In the network of fig 7, the switch k is open and the network reaches a steady state. At t=0 switch k is closed. Find the current in the inductor fot t=0.	**07**
Q.4	**(a)**	State and Explain initial and final value theorem in term of Laplace Transformation.	**03**
	(b)	Obtain step response to R-L series circuit using Laplace Transformation.	**04**

(c) The network shown in fig 8 is in steady state with switch k is closed. At t=0 the switch is opened. Determine $V_k(0+)$, $dV_k/dt(0+)$. **07**

OR

Q.4 **(a)** List advantages of Laplace transformation method over classical method **03**

(b) Find the Laplace transform of the signal $f(t)=e^{-at}\sin(wt)$ **04**

(c) The network shown in fig 9 is in steady state with switch k is opened. At t=0, the switch is closed. For the element values given, determine the values of Va(0-) and Va(0+). **07**

Q.5 **(a)** List out the necessary and sufficient conditions for positive real function **03**

(b) List necessary condition of two port network to be Reciprocal and Symmetric in terms of Z, Y, ABCD, H parameter. **04**

(c) Derive relationship between incidence matrix (A), fundamental tie-set matrix (B_f) and fundamental cut-set matrix (Q_f). **07**

OR

Q.5 **(a)** List properties of Hurwitz polynomial. **03**

(b) Explain various interconnection of two port network. **04**

(c) Derive relation between Z-parameter and Y parameter **07**

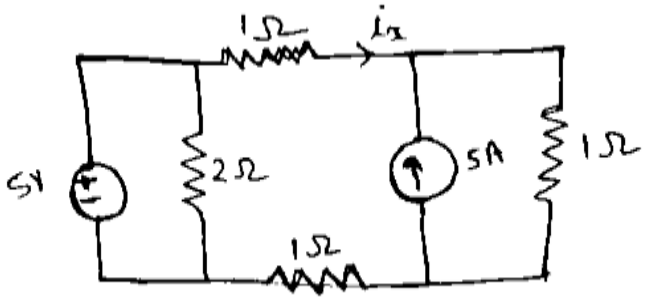

Figure - 1

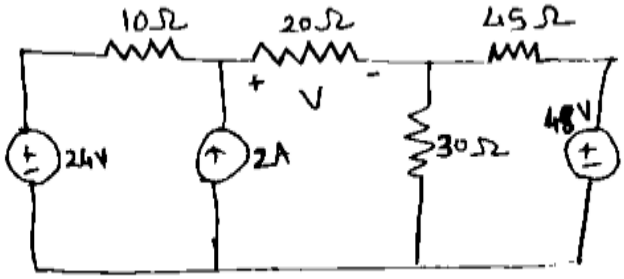

Figure - 2

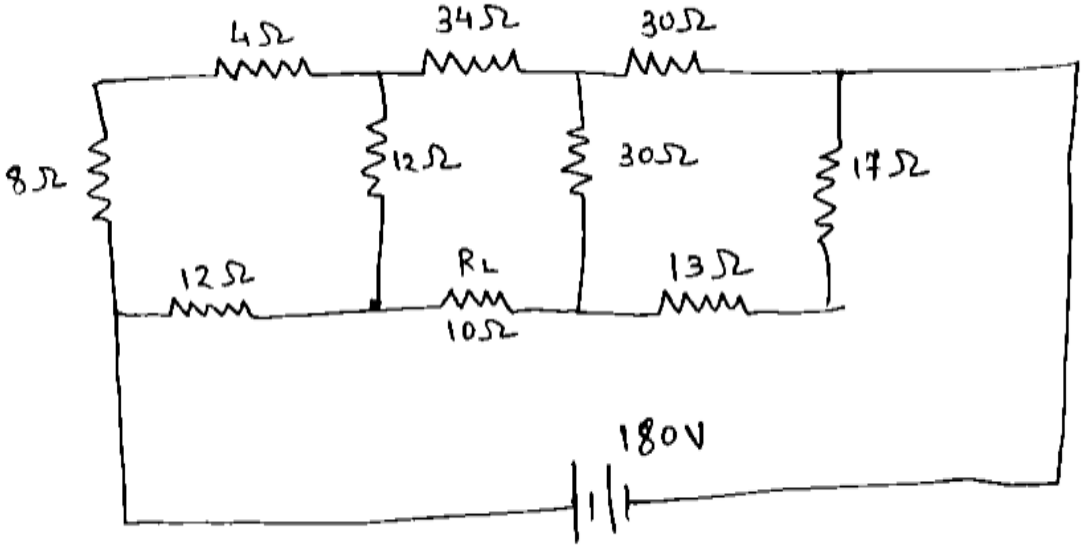

Figure - 3

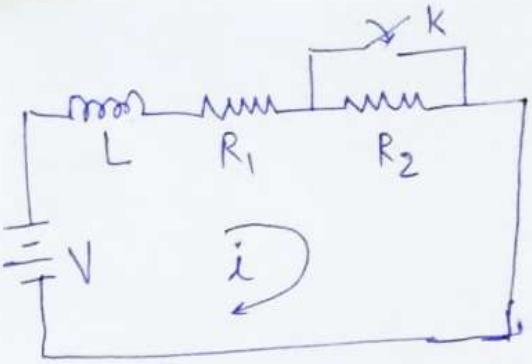

Figure · 4

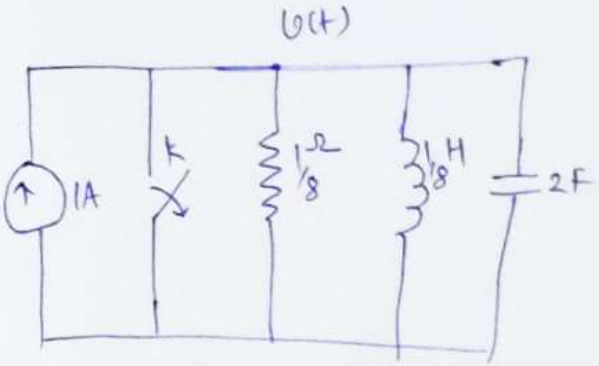

Figure · 5

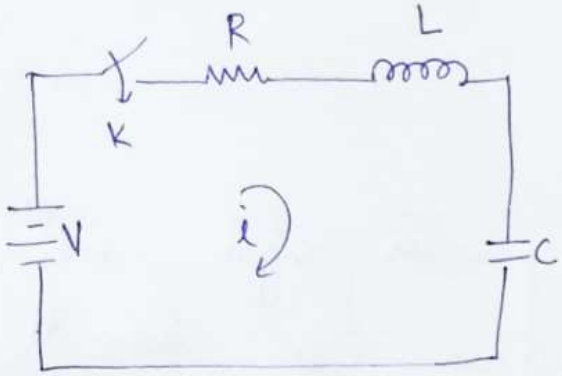

Figure · 6

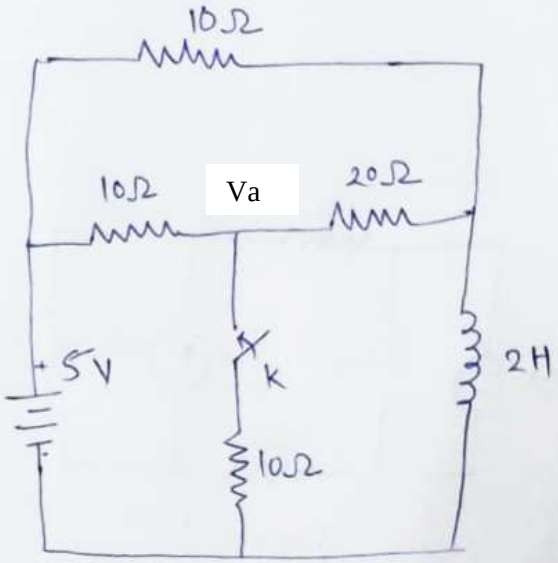

Figure · 7

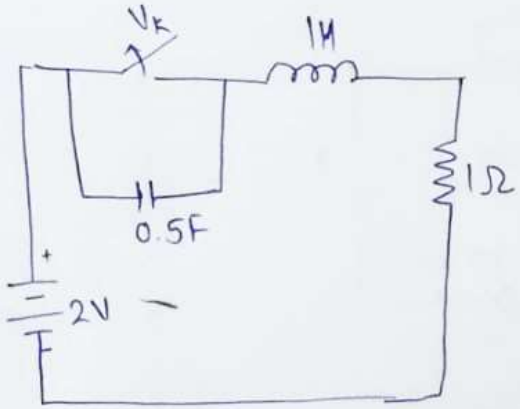

Figure · 8

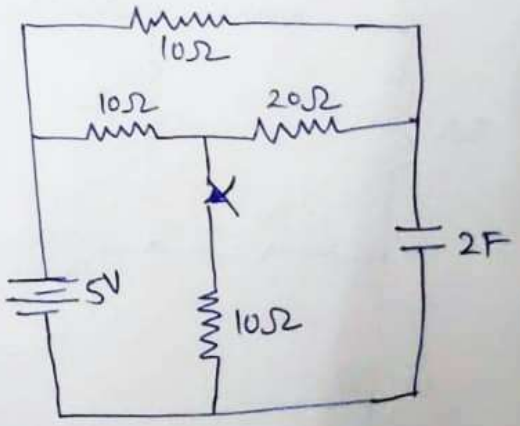

Figure 9

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