Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2130901 **Date: 31/05/2017**

Subject Name: Circuits and Networks

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.**

Q.1		**Do as directed:**	**14**
	1	What is potential difference?	
	2	Explain Ideal Voltage source.	
	3	Super position theorem is applicable to _____ and _____ network.	
	4	Justify: The inductors act as an open circuit at time $t = 0_+$.	
	5	State and explain: Principle of conservation of charge.	
	6	What is transfer function?	
	7	Define: Poles and Zeros of network transfer function.	
	8	Define: Driving point impedance.	
	9	What is two-port network?	
	10	What is the condition for reciprocal network for h-parameters?	
	11	Define: Oriented Graph.	
	12	What is Tree and Co-tree?	
	13	Define: Tie-set.	
	14	Define: Incidence matrix.	
Q.2	**(a)**	State and explain maximum power transfer theorem. Derive the condition for maximum power transfer to load for DC circuit.	**03**
	(b)	Using the specified currents, write the Kirchhoff voltage law equations for the network given in figure – 1.	**04**
	(c)	For the circuit of figure – 2, suppose $V_{in} = 1\ V$. Find R so that $V_{out}/V_{in} = 150$.	**07**
		OR	
	(c)	For the circuit of figure – 3, using mesh analysis find the mesh currents I_1, I_2 and I_3. Also fine voltage v across a dependent source.	**07**
Q.3	**(a)**	What is an impulse function? Find the impulse response $h(t)$ for the network function $H(s) = 1/s^2 + 4s + 4$.	**03**
	(b)	For the network shown in the figure – 4, determine $G_{12} = V_2/V_1$.	**04**
	(c)	For the network of the figure – 5, show that the equivalent Thevenin network is represented by $$V_T = \frac{V_1}{2}(1 + p + q - pq) \quad and \quad R_T = \frac{3 - q}{2}$$	**07**
		OR	
Q.3	**(a)**	Determine the Laplace transform of $f(t) = e^{-at}\cos\omega t$.	**03**
	(b)	Obtain the pole-zero plot of the transform impedance of the network shown in the figure – 6.	**04**
	(c)	For the network of the figure – 7, determine the Thevenin equivalent network for the load R_L.	**07**
Q.4	**(a)**	State and explain initial value theorem.	**03**
	(b)	The network shown in the figure – 8 is in the steady state with the switch K open. At $t = 0$, the switch is closed. Determine the current $i(t)$.	**04**
	(c)	The network shown in the figure – 9 is in the steady state with the switch K	**07**

closed. At $t = 0$, the switch is opened. Determine the voltage across the switch, v_k and dv_k/dt at $t = 0_+$.

OR

Q.4	**(a)**	Write the initial conditions in the inductor and capacitor at $t = 0_+$ and $t = \infty$.	**03**
	(b)	In the network of the figure – 10, the switch K is in position a for a long time. At $t = 0$, the switch is moved from a to b. Find $v_2(t)$ with assumption that the initial current in the *2 h* inductor is zero.	**04**
	(c)	The network shown in the figure – 11 is in the steady state with the switch K open. At $t = 0$, the switch is closed. Determine the values of $v_a(0_-)$ and $v_a(0_+)$.	**07**
Q.5	**(a)**	Determine h-parameters in terms of z-parameters.	**03**
	(b)	For the resistive network shown in the figure – 12, draw the oriented graph and tree. Also develop the fundamental tie-set matrix (B_f).	**04**
	(c)	For the network shown in the figure – 13, determine the y-parameters.	**07**

OR

Q.5	**(a)**	Derive the condition for the network to be reciprocal for ABCD-parameters.	**03**
	(b)	For the resistive network shown in the figure – 12, Develop the incidence matrix A.	**04**
	(c)	For the network shown in the figure – 13, determine the z-parameters.	**07**

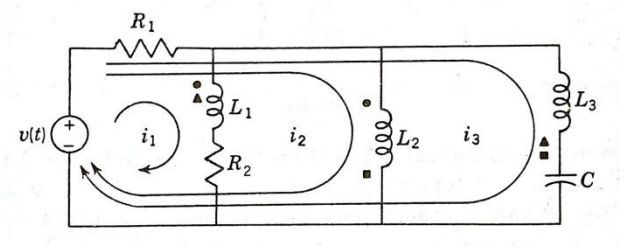

Figure – 1

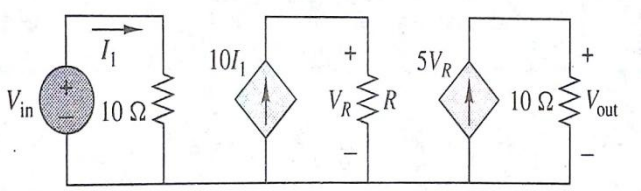

Figure – 2

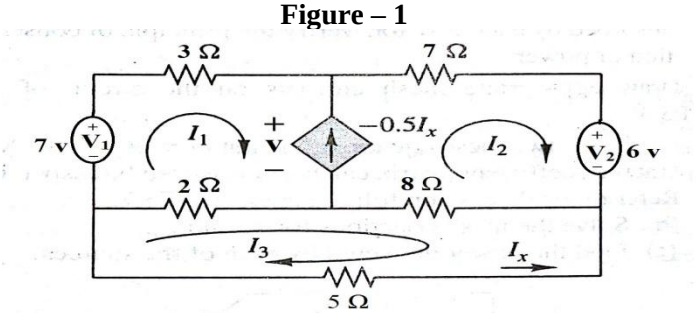

Figure – 3

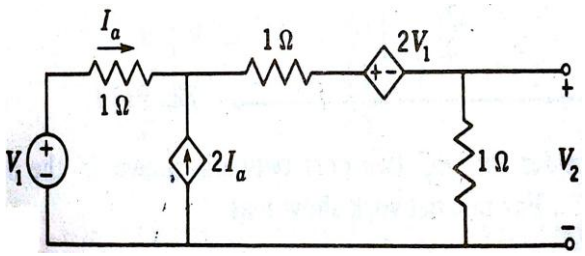

Figure – 4

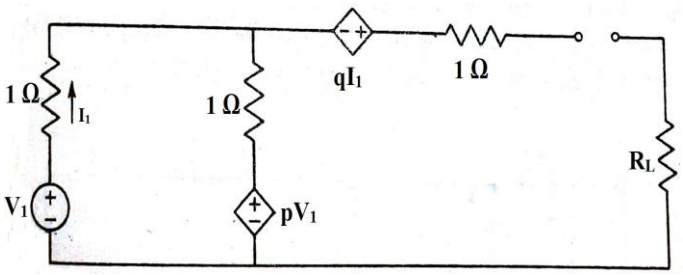

Figure – 5

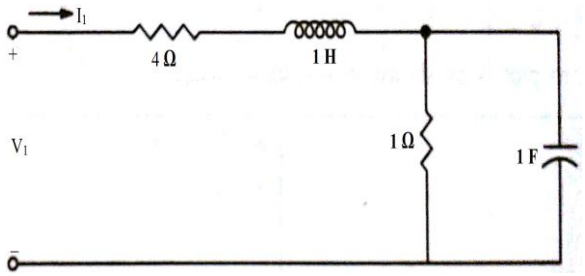

Figure – 6

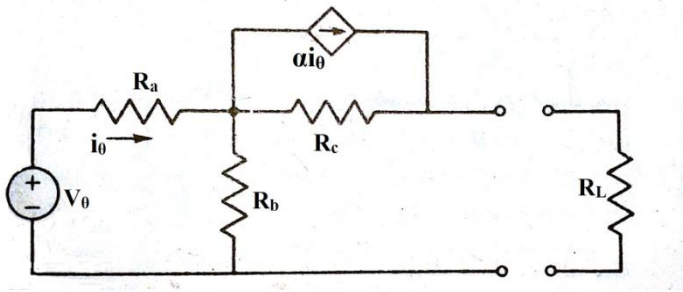

Figure – 7

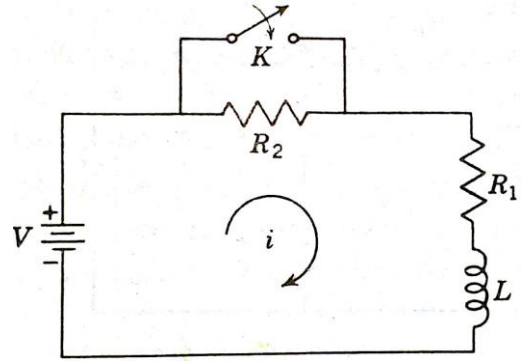

Figure – 8

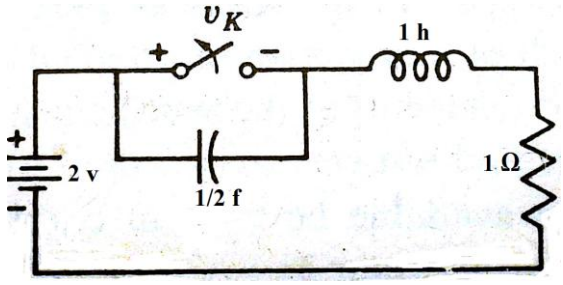

Figure – 9

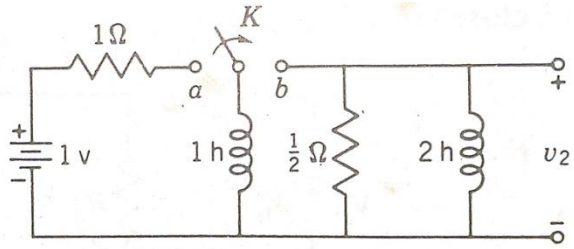

Figure – 10

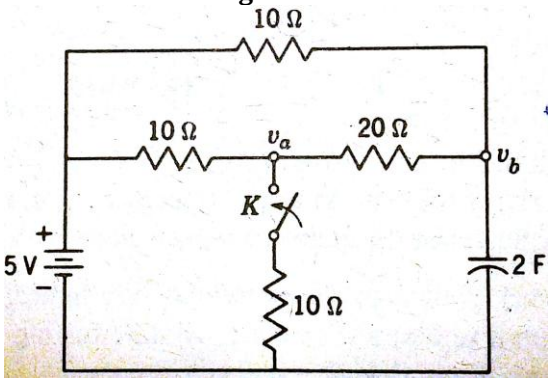

Figure – 11

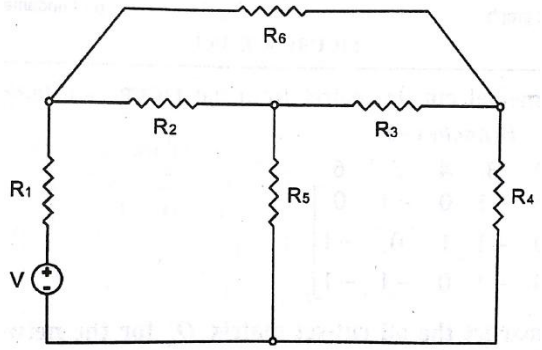

Figure – 12

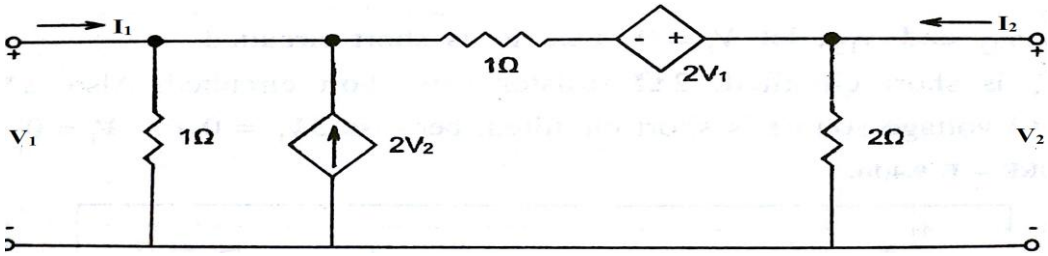

Figure – 13