Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) EXAMINATION – SUMMER 2016

Subject Code:2130901 Date:09/06/2016

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	Draw the V-I characteristic for Ideal Voltage source.	
	3	Super position theorem is applicable to _____ network. (A) Linear (B) Bilateral (C) Linear and Bilateral (D) None of these	
	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 the condition for symmetrical network for z-parameters?	
	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 principle of Duality.	**03**
	(b)	Describe the power and energy relations for two-terminal elements (i.e. Resistor, Inductor and Capacitor).	**04**
	(c)	For the circuit of figure – 1, suppose $V_{in} = 1\ V$. Find R so that $V_{out}/V_{in} = 150$.	**07**
		OR	
	(c)	For the circuit of figure – 2, using mesh analysis find the mesh currents I_1, I_2 and I_3. Also find 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)	Explain significance of poles and zeros in network functions.	**04**
	(c)	For the network of the figure – 3, 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 – 4.	**04**
	(c)	For the network of the figure – 5, determine the Thevenin equivalent network for the load R_L.	**07**
Q.4	**(a)**	State and explain initial value theorem.	**03**
	(b)	Briefly describe the network synthesis and its application.	**04**
	(c)	The network shown in the figure – 6 is in the steady state with the switch *K* closed. At $t = 0$, the switch is opened. Determine the voltage across the switch, v_k and dv_k/dt at $t = 0_+$.	**07**

OR

Q.4	**(a)**	Write the initial conditions for the inductor and capacitor at $t = 0_+$ and $t = \infty$.	**03**
	(b)	Briefly explain Positive Real Function.	**04**
	(c)	In the network of the figure – 7, 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.	**07**
Q.5	**(a)**	Determine y-parameters in terms of z-parameters.	**03**
	(b)	For the resistive network shown in the figure – 8, draw the oriented graph and tree. Also develop the fundamental tie-set matrix (B_f).	**04**
	(c)	For the network shown in the figure – 9, 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 – 8, Develop the incidence matrix *A*.	**04**
	(c)	For the network shown in the figure – 9, determine the z-parameters.	**07**

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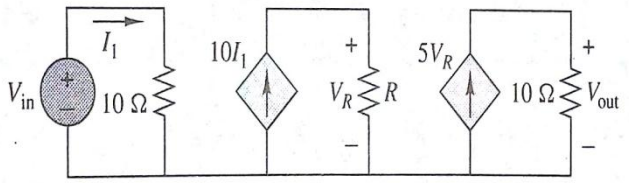

Figure – 1

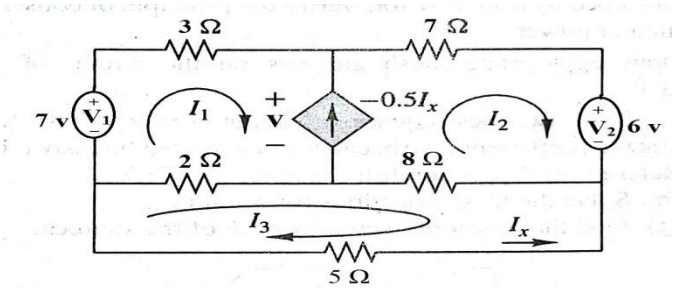

Figure – 2

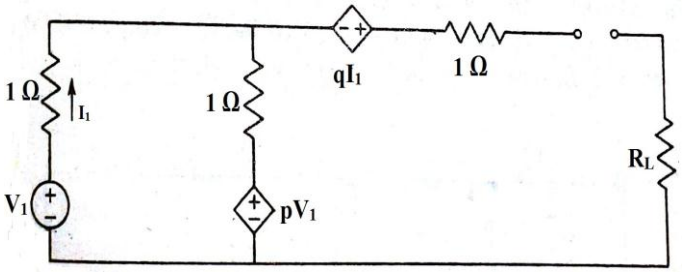

Figure – 3

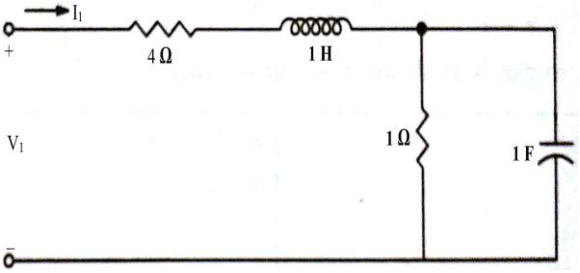

Figure – 4

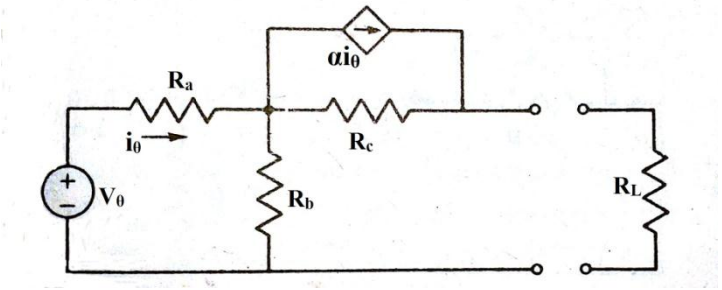

Figure – 5

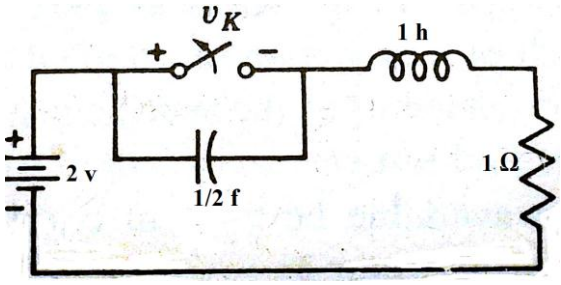

Figure – 6

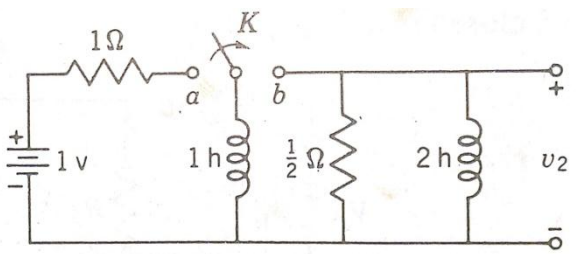

Figure – 7

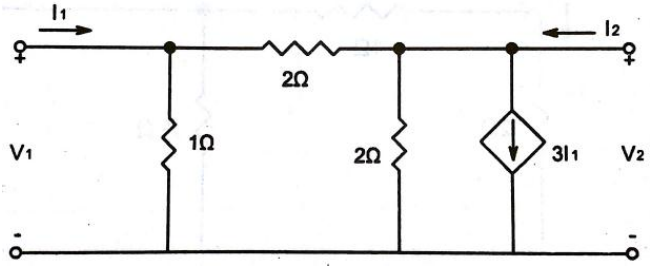

Figure – 9

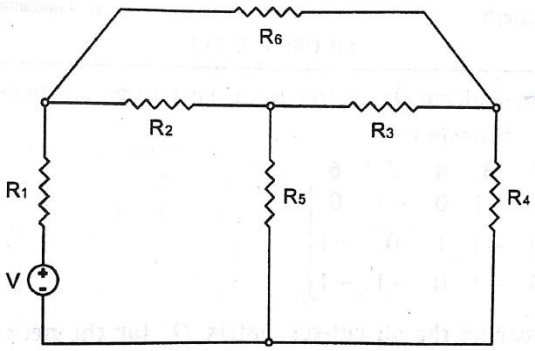

Figure –8