Date:09/06/2016

**Total Marks: 70** 

## **GUJARAT TECHNOLOGICAL UNIVERSITY**

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

Subject Code:2130901

Subject Name: Circuits and Networks

Time:10:30 AM to 01:00 PM

**Instructions:** 

- 1. Attempt all questions.
- Make suitable assumptions wherever necessary. 2.
- 3. Figures to the right indicate full marks.

## Q.1 Do as directed:

- What is potential difference? 1
- 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 Justify: The inductors act as an open circuit at time  $t = 0_+$ .
- 4 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?
- Define: Oriented Graph. 11
- What is Tree and Co-tree? 12
- 13 Define: Tie-set.
- 14 Define: Incidence matrix.
- State and explain principle of Duality. Q.2 (a) Describe the power and energy relations for two-terminal elements (i.e. **(b)** 
  - 04 Resistor, Inductor and Capacitor). (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  $I_1, I_2$ 07 and  $I_3$ . Also find voltage v across a dependent source.
- What is an impulse function? Find the impulse response h(t) for the network **Q.3** 03 (a) function  $H(s) = 1/s^2 + 4s + 4$ . 04
  - Explain significance of poles and zeros in network functions. **(b)**
  - For the network of the figure -3, show that the equivalent Thevenin network is 07 (c) represented by

$$V_T = \frac{V_1}{2}(1 + p + q - pq)$$
 and  $R_T = \frac{3 - q}{2}$   
OR

- Determine the Laplace transform of  $f(t) = e^{-at} \cos \omega t$ . Q.3 **(a)** 
  - (b) Obtain the pole-zero plot of the transform impedance of the network shown in 04 the figure -4.
  - For the network of the figure -5, determine the Thevenin equivalent network 07 (c) for the load  $R_L$ .
- **Q.4 (a)** State and explain initial value theorem.
  - **(b)** Briefly describe the network synthesis and its application.
  - The network shown in the figure -6 is in the steady state with the switch K 07 (c) closed. At t = 0, the switch is opened. Determine the voltage across the switch,  $v_k$  and  $dv_k/dt$  at  $t = 0_+$ .

03

03

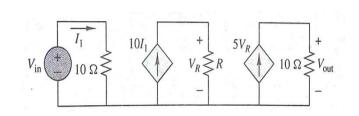
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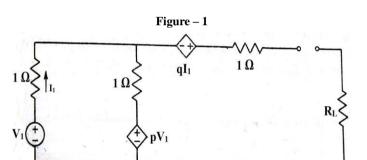
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## OR

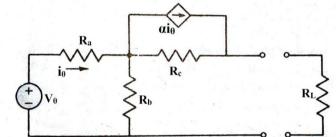
Q.4	<b>(a)</b>	Write the initial conditions for the inductor and capacitor at $t = 0_+$ and $t = \infty$ .	03
	<b>(b)</b>	Briefly explain Positive Real Function.	04
	(c)	In the network of the figure $-7$ , the switch K is in position a for a long time. At	07
		$t = 0$ , the switch is moved from a to b. Find $v_2(t)$ with assumption that the	
		initial current in the 2 h inductor is zero.	
Q.5	<b>(a)</b>	Determine y-parameters in terms of z-parameters.	03
	<b>(b)</b>	For the resistive network shown in the figure $-8$ , draw the oriented graph and	04
		tree. Also develop the fundamental tie-set matrix $(B_f)$ .	
	(c)	For the network shown in the figure $-9$ , determine the y-parameters.	07
OR			
Q.5	<b>(a)</b>	Derive the condition for the network to be reciprocal for ABCD-parameters.	03
	<b>(b)</b>	For the resistive network shown in the figure $-8$ , Develop the incidence matrix	04
		А.	
	(c)	For the network shown in the figure $-9$ , determine the z-parameters.	07

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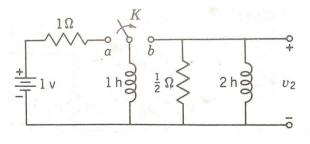




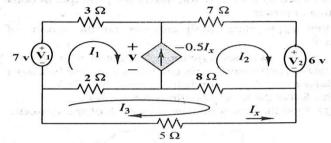




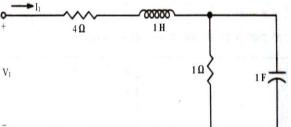


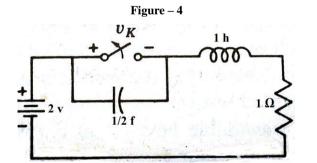














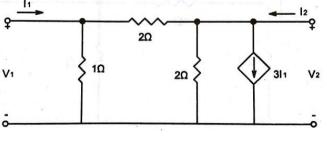


Figure – 9

2

