GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (New) EXAMINATION – WINTER 2015

Subject Code:2130901   **Date:02/01/2016**
Subject Name: Circuits and Networks
Time: 2:30pm to 5:00pm   **Total Marks: 70**
Instructions:
  1. **Attempt all questions.**
  2. **Make suitable assumptions wherever necessary.**
  3. **Figures to the right indicate full marks.**

		MARKS

**Q.1**   **Short Questions**   **14**

1   Which of the following statement is correct in relation to inductor as a circuit element? Consider V_L as voltage across the inductor and I_L as current through the inductor.

(A) Both V_L and I_L can change instantaneously
(B) Neither V_L nor I_L can change instantaneously
(C) I_L can change instantaneously but V_L cannot
(D) V_L can change instantaneously but I_L cannot

2   Show the graph of terminal voltage versus the load current for an ideal DC voltage source.

3   Which law is used to formulate the network equations in nodal analysis? (KCL /KVL /Thumb rule /None of these)

4   The Thevenin's equivalent voltage source for a network is 2 Volt and Thevenin's equivalent resistance is 2 Ohm. Find the Norton's equivalent current source for the same network.

5   Write the statement of maximum power transfer theorem.

6   If the circuit elements are ideal inductor and ideal resistor, find the current supplied by the ideal sinusoidal voltage source in steady state condition for the circuit shown in the following figure.
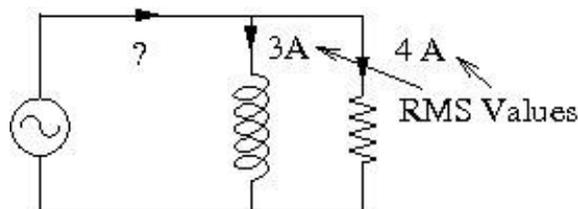

7   Draw a circuit diagram using any of the components (R, L, C and Active source) for a first order system of your choice.

8   If a step input voltage is given to an L-C series circuit (there is no resistance), what is the waveform of current passing through the circuit?

9   Calculate the value of voltage just after switching (at time t=0+) in the circuit shown in the following figure.
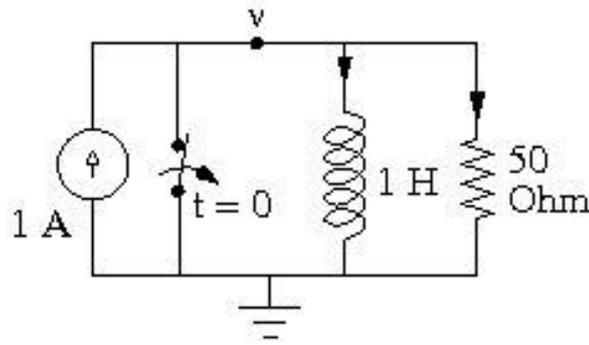
10 What is the Laplace transform of a unit step signal?

11 What do you mean by pole of a system?

12 Write the equation for hybrid parameters of a two-port network.

13 Show the relationship between hybrid parameters and g-parameters of a two port network.

14 Define the term "Tree" applicable to network topology.

Q.2 **(a)** Mention the relations between voltage and current for the following passive elements. (1) Resistor (2) Capacitor.   **03**

(b) Draw the characteristics and differentiate between ideal current source and actual current source.   **04**

(c) Find the current passing through the 2 Ohm resistor using Mesh analysis for the circuit shown in the following figure.   **07**
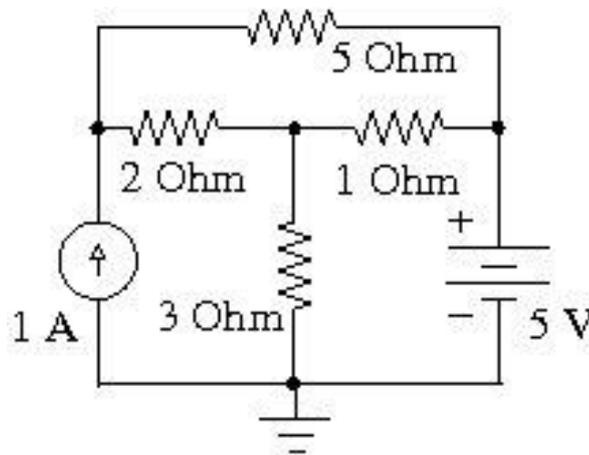

OR

(c) Obtain the value of Norton's equivalent current and Norton's equivalent resistance for the network shown in the following figure.   **07**
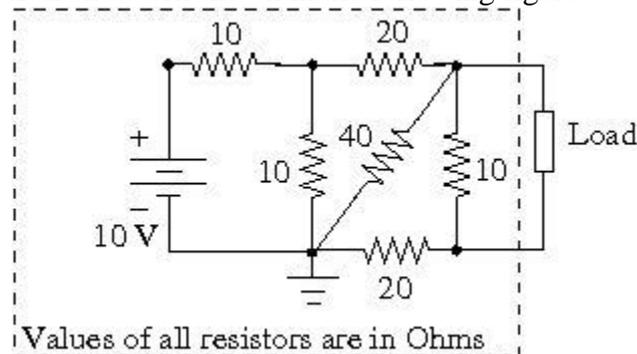

Q.3 **(a)** Explain the principle of source transformation to obtain equivalent voltage source from a current source.   **03**

(b) Briefly describe the nodal analysis with a small example.   **04**

(c) Find out the values of 'v' ; 'dv/dt' and 'd^2v/dt^2' just after switching (at time $t = 0+$) in the circuit shown in the following figure.   **07**
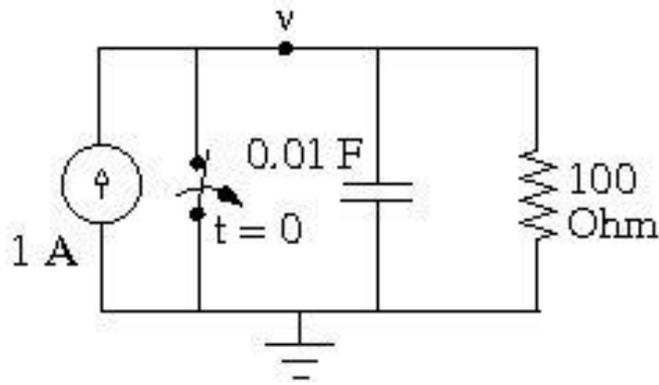
OR

Q.3 **(a)** Find out the poles of the system described in the immediately next question i.e. Q-3(b). **03**

(b) Write the circuit equations for a series RC circuit connected to a DC supply. Using Laplace transform, obtain the transfer function between capacitor voltage and supply voltage. **04**

(c) Explain the procedure to obtain sinusoidal steady state response of a circuit. **07**

Q.4 **(a)** Briefly describe Millman's theorem. **03**

(b) Derive the equation of inductor current and draw its waveform for a series R-L circuit connected to a step input voltage. **04**

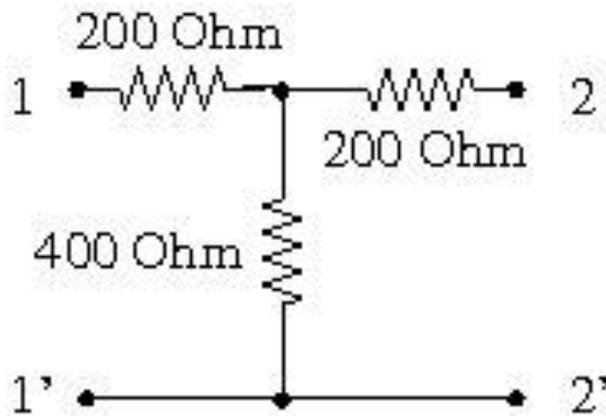**(c)** Find out the Z-parameters of the two port network shown in the following figure. **07**

Values of all resistors are in Ohms
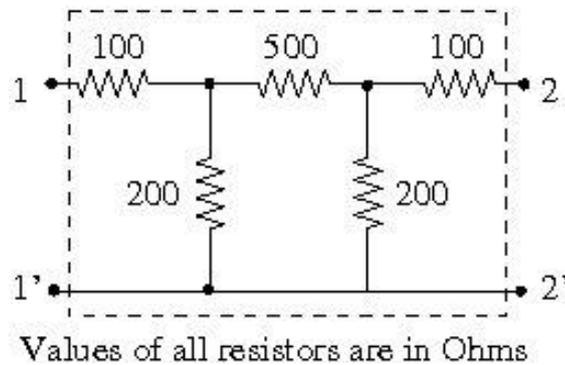
OR

Q.4 **(a)** Find out the equivalent ABCD parameters of the cascade combination of two networks as shown in the following figure. **03**
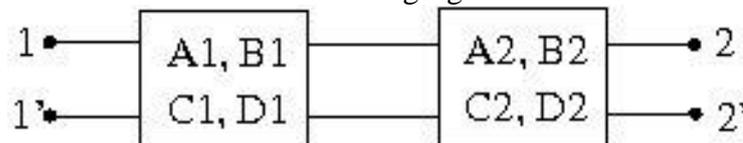

(b) Find out the Y-parameters of the network shown in the following figure. **04**

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(c) What do you mean by a first order system? Give two examples of first order systems. Explain the procedure to obtain the transient response of a first order system.   **07**

Q.5 **(a)** A graph of a network is shown in the following figure. Obtain the reduced incidence matrix from the graph. You are not allowed to change the directions of elements, its numbering and numbering of nodes. Elements of tree are shown as solid lines. Links are shown as dotted lines.   **03**
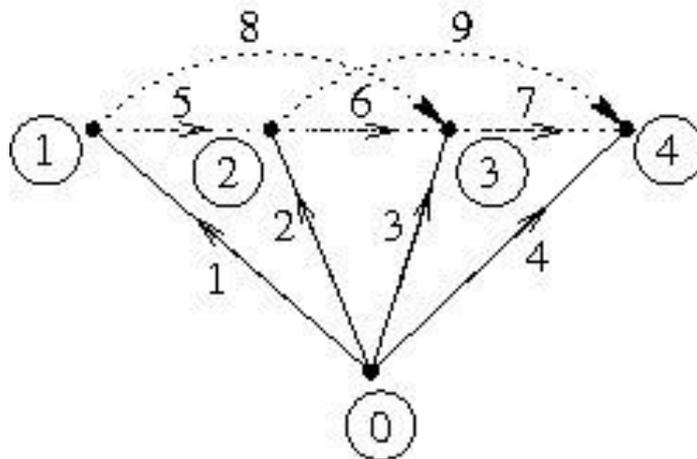
(b) Obtain the fundamental cut-set matrix for the graph shown in the previous question i.e. Q-5(a)   **04**

(c) With suitable example explain how the Laplace transform is useful in obtaining the transient response of a second order system.   **07**

OR

Q.5 **(a)** Describe the steps to evaluate the initial conditions of a network.   **03**

(b) Briefly describe the network synthesis and its application.   **04**

(c) Obtain the fundamental loop matrix for the graph shown in the previous question i.e. Q-5(a). Explain how this matrix can be used to formulate network equations.   **07**

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