

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III(New) • EXAMINATION – WINTER 2016

Subject Code:2130901

Date:02/01/2017

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.

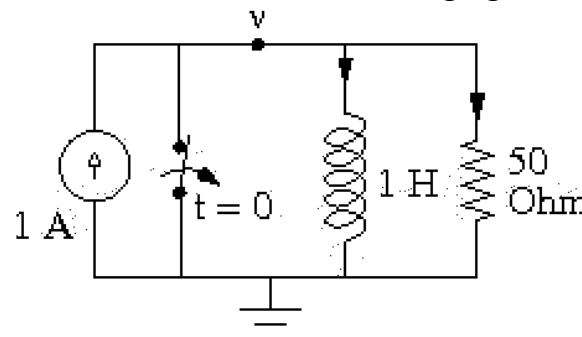
MARKS

Q.1 Short Questions

14

- 1 Which of the following statement is correct in relation to capacitor as a circuit element? Consider V_C as voltage across the capacitor and I_C as current through the capacitor.

(A) Both V_C and I_C can change instantaneously
(B) Neither V_C nor I_C can change instantaneously
(C) I_C can change instantaneously but V_C cannot
(D) V_C can change instantaneously but I_C cannot
- 2 Show the graph of current through series RL circuit connected to a step input.
- 3 Which analysis is more suitable if the number of nodes in the network is less than the number of meshes?
- 4 Write the statement of Norton's theorem.
- 5 What is the difference in KCL applied to DC circuits and KCL applied to AC circuits?
- 6 What do you mean by a second order system?
- 7 A graph has 6 nodes and 12 elements. Find the number of links (chords) for this graph.
- 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 after infinite time, after switching (at time $t = \text{Infinity}$) in the circuit shown in the following figure.



- 10 What is the Laplace transform of a sine wave?
- 11 What do you mean by transfer function of a system?
- 12 Write the equation for admittance 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 "Fundamental loop" applicable to network topology.

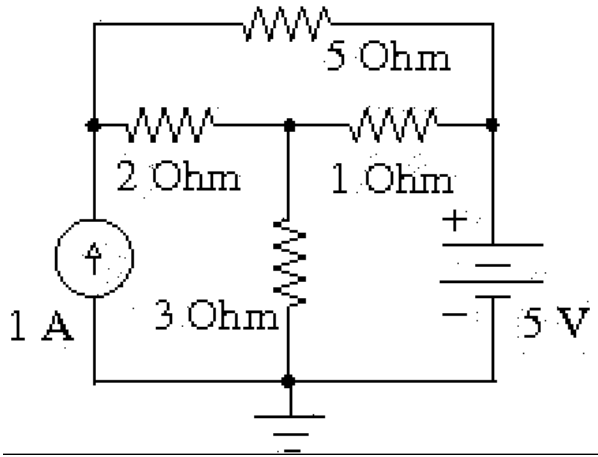
Q.2 (a) Explain the characteristic of an ideal current source.

03

(b) Write the voltage current relationships of pure inductor and pure

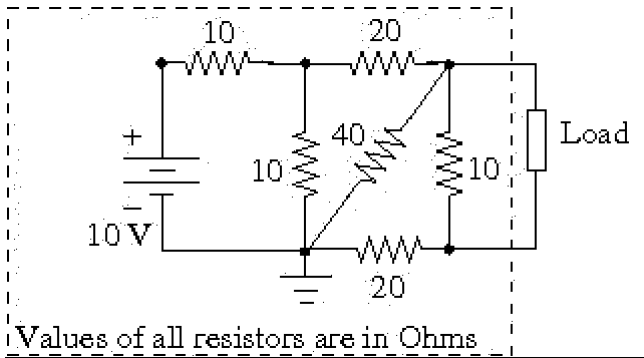
04

- capacitor.
- (c) Find the current passing through 3 Ohm resistor in the following circuit using nodal analysis. 07

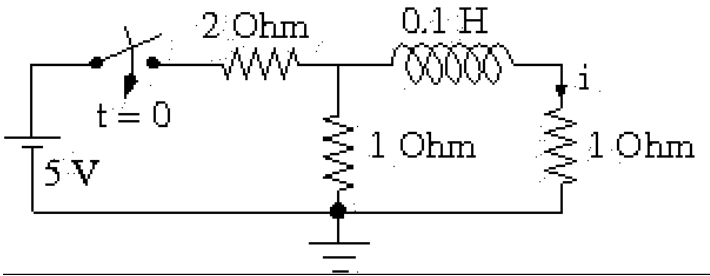


OR

- (c) Obtain the value of Thevenin's equivalent voltage and Thevenin's equivalent resistance for the network shown in the following figure. 07



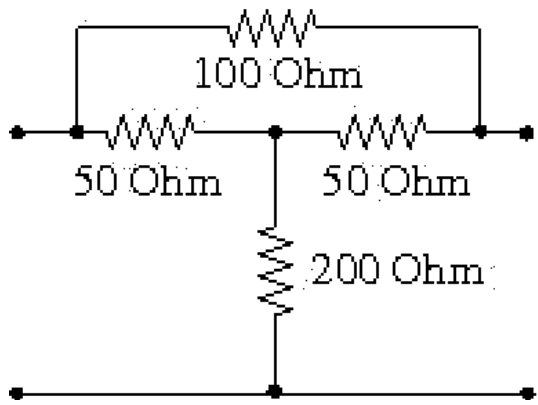
- Q.3** (a) Briefly explain the mesh analysis. 03
(b) Differentiate between mesh analysis and nodal analysis 04
(c) Find out the values of ' i ' ; ' di/dt ' and ' d^2i/dt^2 ' just after switching (at time $t = 0+$) in the circuit shown in the following figure. 07



OR

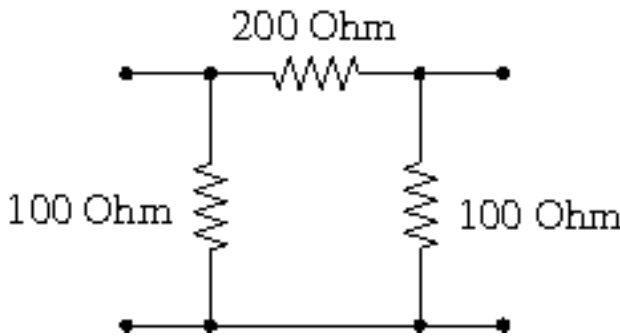
- Q.3** (a) Write the circuit equations for a series RL circuit connected to a DC supply. Using Laplace transform, obtain the transfer function between Inductor current and supply voltage. 03
(b) Find the poles of the system described in previous question i.e. Q-3(a). 04
(c) Briefly describe the application of Laplace transform for transfer function approach in circuit analysis. 07
- Q.4** (a) Briefly describe superposition theorem. 03
(b) Explain the time response of R-L-C series circuit with step input. 04

- Assume critically damped system.
- (c) Find out the Z-parameters of the two port network shown in the following figure. 07

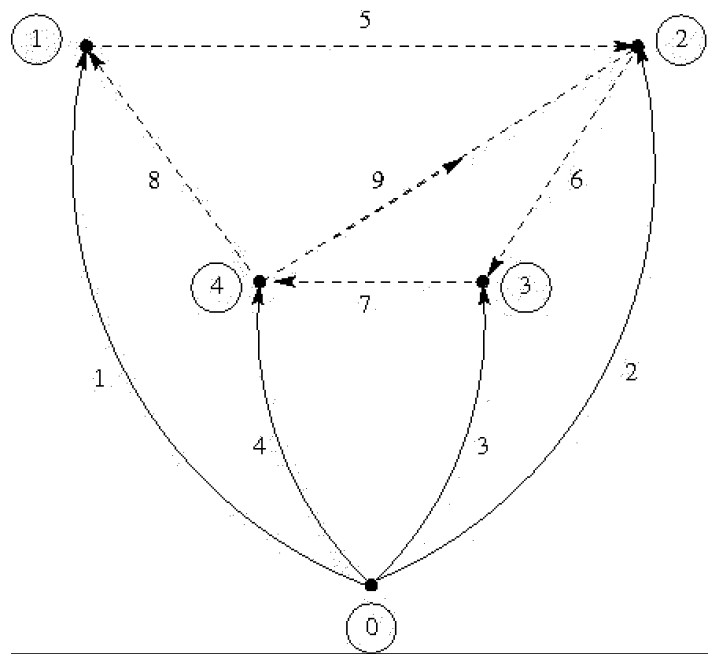


OR

- Q.4 (a) Briefly describe ABCD parameters and inverse ABCD parameters for a symmetric two port network. 03
- (b) Find out the Y-parameters of the network shown in the following figure. 04



- (c) Take suitable example of a first order system and explain the procedure to obtain its transient response. 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)

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
- OR
- Q.5 (a)

What is network synthesis?

03
- (b)

Explain the reciprocity theorem.

04
- (c)

Briefly describe the rules for initial conditions calculation of various circuit elements.

07
