

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 $V_{in} = 1\text{ V}$. 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 07**
- $$V_T = \frac{V_1}{2}(1 + p + q - pq) \quad \text{and} \quad R_T = \frac{3 - q}{2}$$
- 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

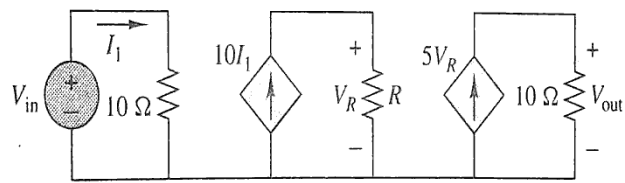


Figure – 1

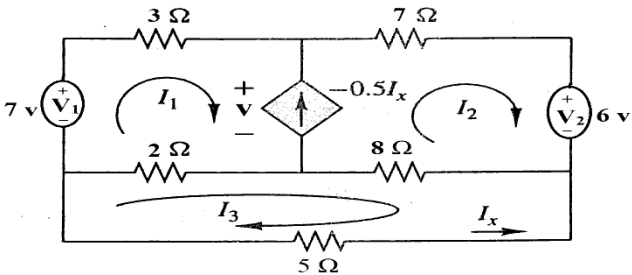


Figure – 2

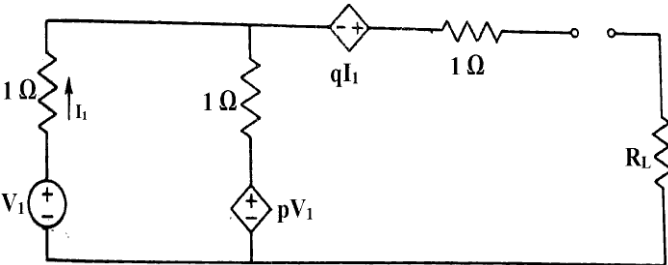


Figure – 3

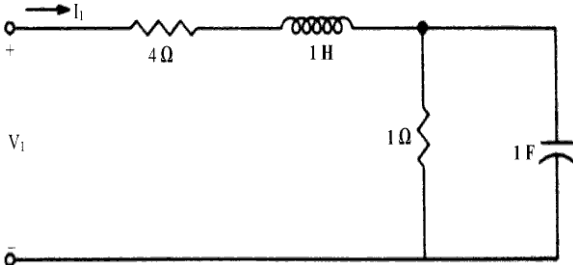


Figure – 4

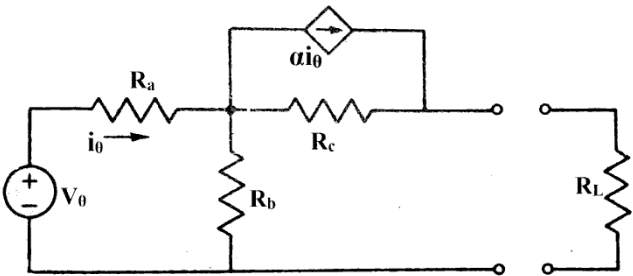


Figure – 5

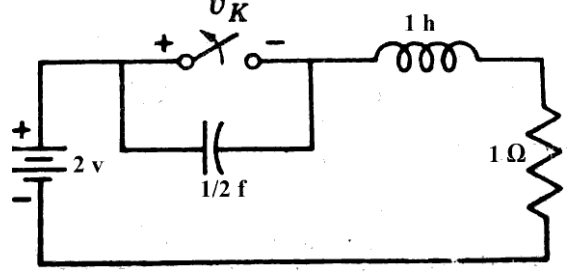


Figure – 6

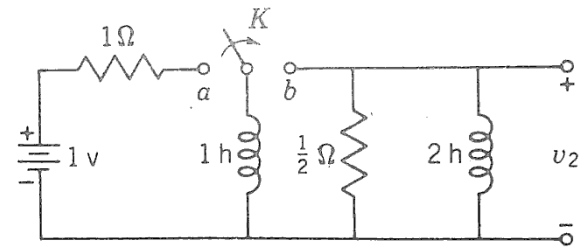


Figure – 7

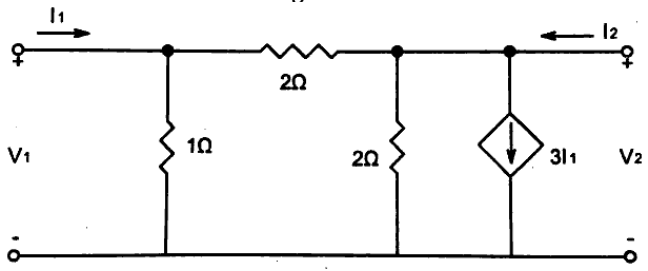


Figure – 9

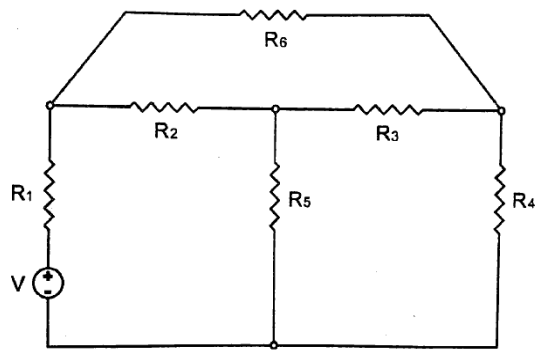


Figure -8