

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2017****Subject Code: 2130901****Date: 31/05/2017****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.

- Q.1 Do as directed: 14**
- 1 What is potential difference?
 - 2 Explain Ideal Voltage source.
 - 3 Super position theorem is applicable to _____ and _____ network.
 - 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 two-port network?
 - 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 maximum power transfer theorem. Derive the condition for maximum power transfer to load for DC circuit. 03**
- (b) Using the specified currents, write the Kirchhoff voltage law equations for the network given in figure – 1. 04**
- (c) For the circuit of figure – 2, suppose $V_{in} = 1 V$. Find R so that $V_{out}/V_{in} = 150$. 07**
- OR**
- (c) For the circuit of figure – 3, 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) For the network shown in the figure – 4, determine $G_{12} = V_2/V_1$. 04**
- (c) For the network of the figure – 5, 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 – 6. 04**
- (c) For the network of the figure – 7, determine the Thevenin equivalent network for the load R_L . 07**
- Q.4 (a) State and explain initial value theorem. 03**
- (b) The network shown in the figure – 8 is in the steady state with the switch K open. At $t = 0$, the switch is closed. Determine the current $i(t)$. 04**
- (c) The network shown in the figure – 9 is in the steady state with the switch K 07**

closed. At $t = 0$, the switch is opened. Determine the voltage across the switch, v_k and dv_k/dt at $t = 0_+$.

OR

- Q.4** (a) Write the initial conditions in the inductor and capacitor at $t = 0_+$ and $t = \infty$. **03**
 (b) In the network of the figure – 10, the switch K is in position a for a long time. **04**
 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.
 (c) The network shown in the figure – 11 is in the steady state with the switch K open. **07**
 At $t = 0$, the switch is closed. Determine the values of $v_a(0_-)$ and $v_a(0_+)$.
- Q.5** (a) Determine h-parameters in terms of z-parameters. **03**
 (b) For the resistive network shown in the figure – 12, draw the oriented graph and **04**
 tree. Also develop the fundamental tie-set matrix (B_f).
 (c) For the network shown in the figure – 13, 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 – 12, Develop the incidence **04**
 matrix A .
 (c) For the network shown in the figure – 13, determine the z-parameters. **07**

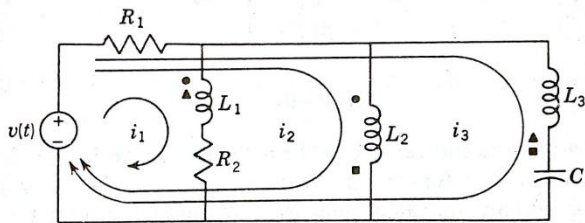


Figure – 1

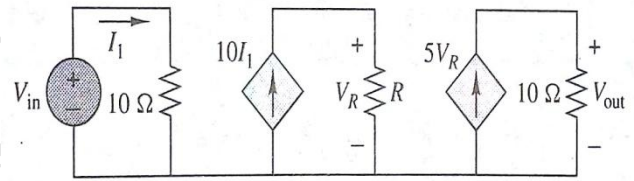


Figure – 2

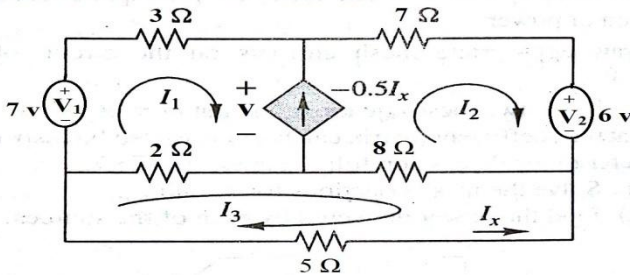


Figure – 3

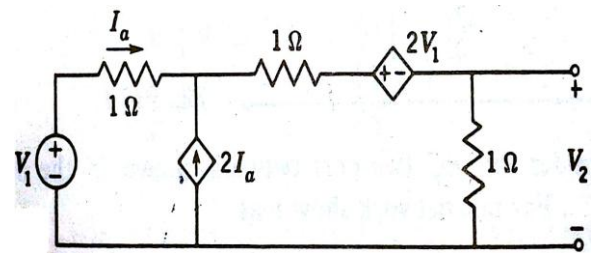


Figure – 4

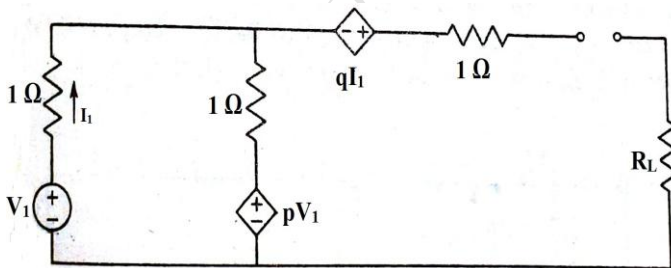


Figure – 5

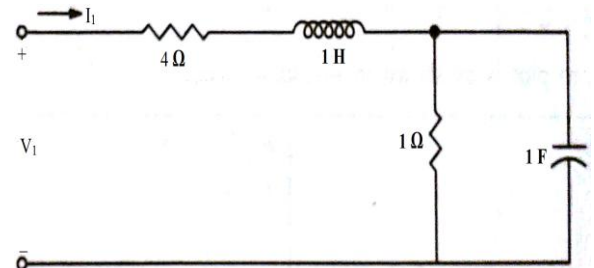


Figure – 6

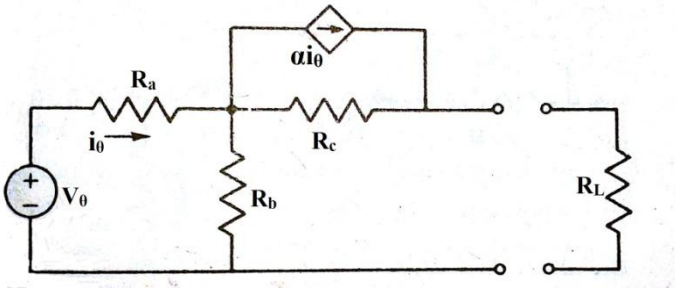


Figure - 7

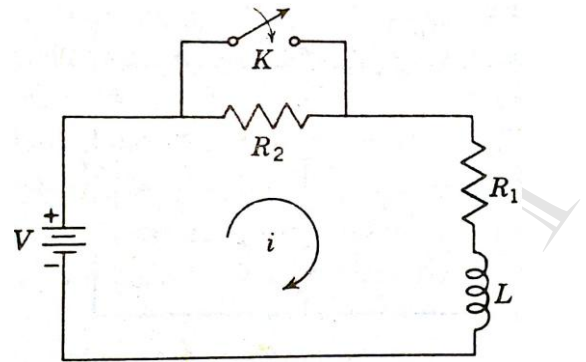


Figure - 8

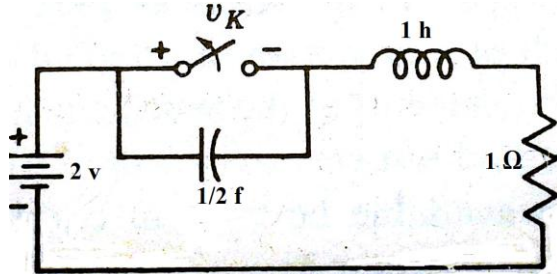


Figure - 9

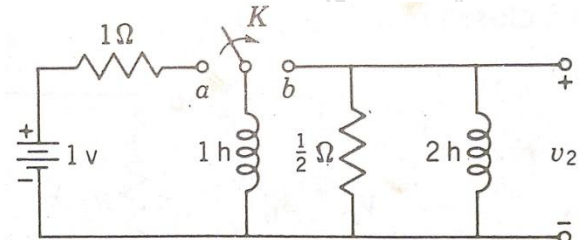


Figure - 10

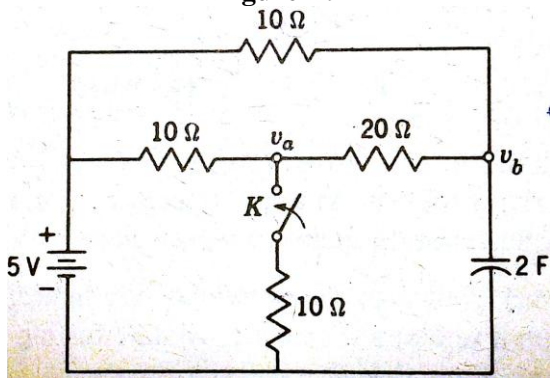


Figure - 11

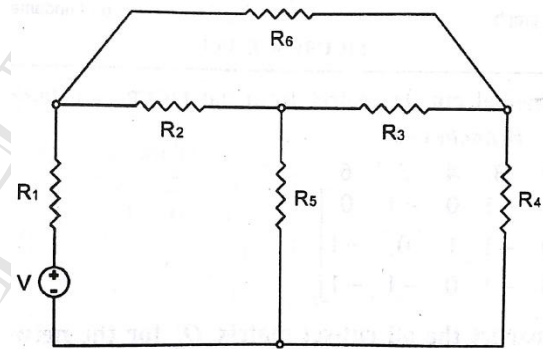


Figure - 12

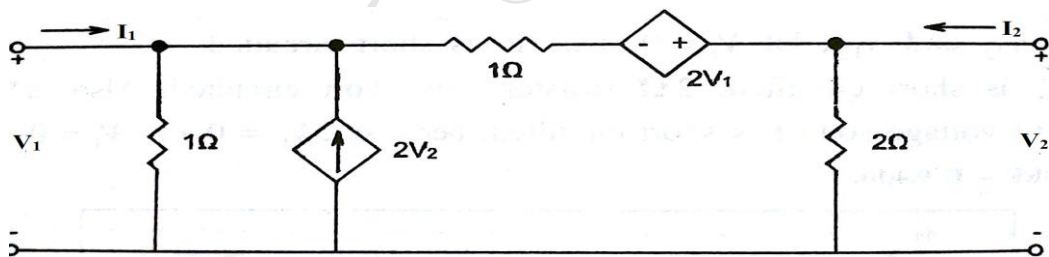


Figure - 13