

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 3131103****Date: 3/12/2019****Subject Name: Network Theory****Time: 02:30 PM TO 05:00 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 (a) Draw Ideal and Practical Current and Voltage source characteristics. In what respect practical current and voltage sources are different from ideal current and voltage sources.	03
(b) Derive current, voltage, power and energy equations of two terminal elements Resistor, Inductor and Capacitor.	04
(c) Determine the current in 4Ω resistor using mesh analysis for the network shown in figure 1.	07
Q.2 (a) Derive the condition of maximum power transfer for the variable resistance as a load circuit.	03
(b) What is equivalent circuit of the charged and uncharged inductor and capacitor at $t=0+$ and $t=\infty$.	04
(c) Determine the value of I_1 using superposition theorem for the circuit shown in figure 2.	07
OR	
(c) Find the current in 4Ω resistor for the circuit shown in figure 3 using Thevenin's theorem and also find maximum power dissipation by the 4Ω .	07
Q.3 (a) Define the time-constant of RL and RC networks and explain the significance of the time-constant.	03
(b) In the network shown in figure 4, the switch k is moved from position 1 to 2 at $t=0$, steady state having previously been attained. Determine the current $i(t)$ for the $t \geq 0$.	04
(c) In the network shown in figure 5, the switch k is changed from position 1 to 2 at $t=0$. Find values of i , di/dt and d^2i/dt^2 at $t=0+$ if $R=1000\Omega$, $L=1H$, $C=0.1\mu F$ and $V=100V$.	07
OR	
Q.3 (a) In the network shown in figure 6, the switch k is closed at $t=0$, a steady state having previously been attained. Find $i(t)$ for $t \geq 0$.	03
(b) An exponential voltage $v(t)=4e^{-3t}$ is applied at time $t=0$ to a series R-L circuit consisting of a resistor $R=0.5\Omega$ and inductor $L=0.25H$ as shown in figure 7 Obtain the expression of current $i(t)$ for $t \geq 0$. Assume zero current through the inductor before switching.	04
(c) Obtain z-parameters for the network shown in figure 8.	07
Q.4 (a) Write the procedure to obtain Thevenin's equivalent voltage and resistance for the different types of network.	03
(b) In the network shown in figure 9 the switch k is moved from position a to b at $t=0$, a steady state existing in	04

position a before $t=0$. Solve for the current $i(t)$ using the Laplace transformation method.

- (c) Find the Norton's equivalent circuit for the network shown in figure 10 and obtain current in 10Ω (load resistor). 07

OR

- Q.4** (a) Find the Laplace transform of the signal $f(t)=e^{-at}\sin(\omega t)$. 03

- (b) Obtain the voltage across the capacitor in the LC circuit shown in figure 11 using Laplace transformation technique, if initial voltage across capacitor is 2V. 04

- (c) Using nodal analysis determine the current I in the circuit shown in figure 12. 07

- Q.5** (a) Define (1) Oriented Graph (2) Tree and (3) Incidence matrix. 03

- (b) Define symmetry and reciprocity conditions for two port network also derive conditions of symmetry and reciprocity of the two port network in terms of Z parameters. 04

- (c) For the circuit shown in figure 13 draw the oriented graph and obtain the (1) Incidence matrix (2) f-cutset matrix and (3) tieset matrix. 07

OR

- Q.5** (a) List out the necessary and sufficient conditions for positive real function. 03

- (b) Determine the inductance between the terminals for three coil shown in figure 14. 04

- (c) For the circuit shown in figure 15 draw the oriented graph and obtain the (1) Incidence matrix (2) f-cutset matrix and (3) tieset matrix. 07

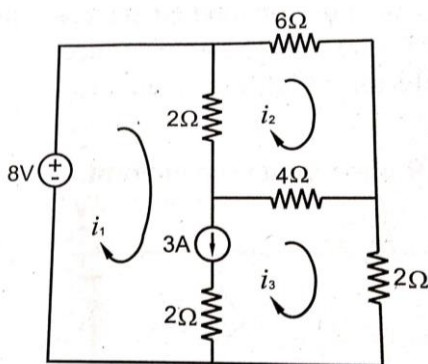


Figure 1

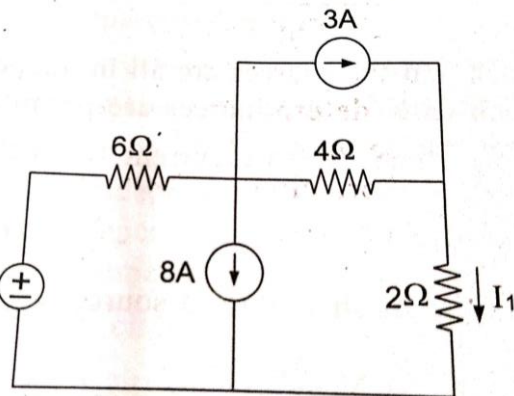


Figure 2

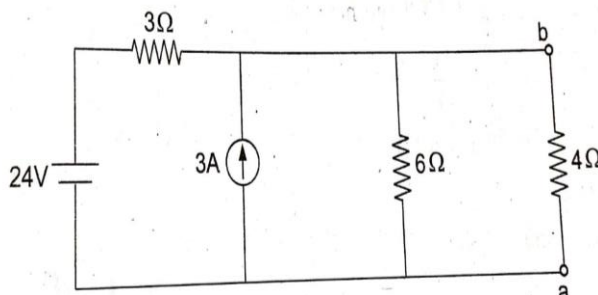


Figure 3

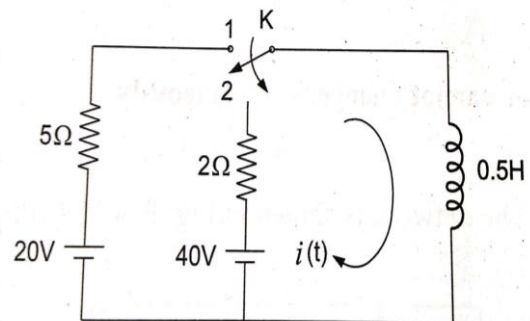


Figure 4

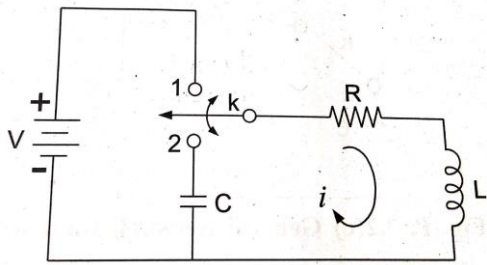


Figure 5

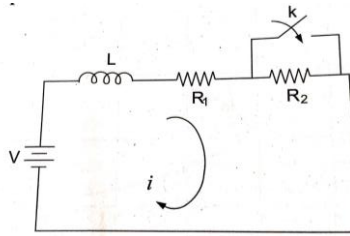


Figure 6

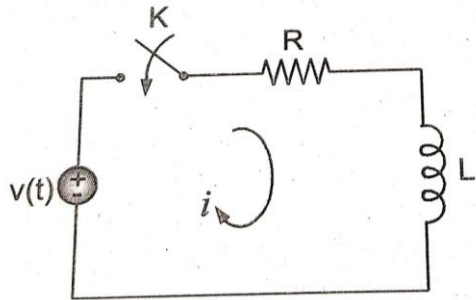


Figure 7

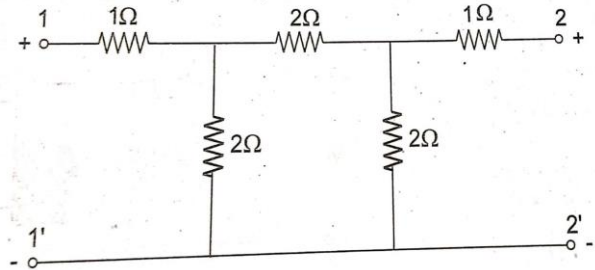


Figure 8

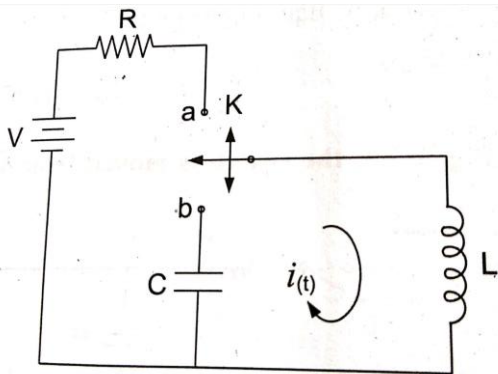


Figure 9

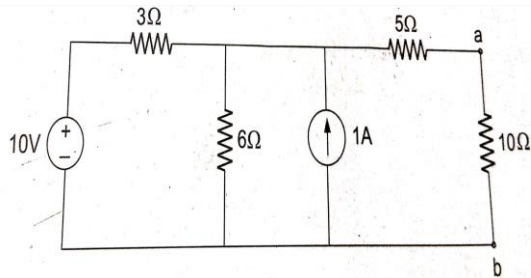


Figure 10

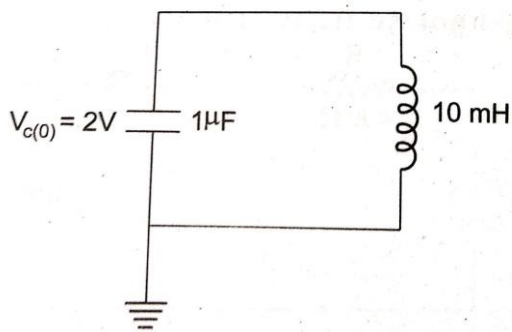


Figure 11

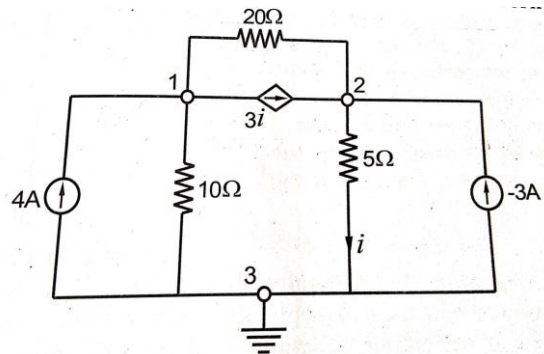


Figure 12

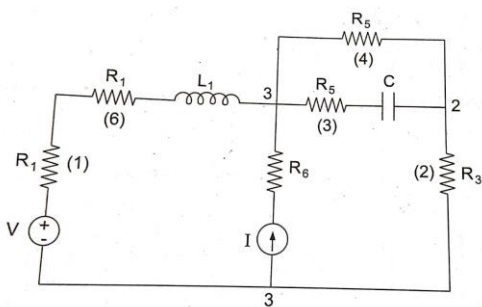


Figure 13

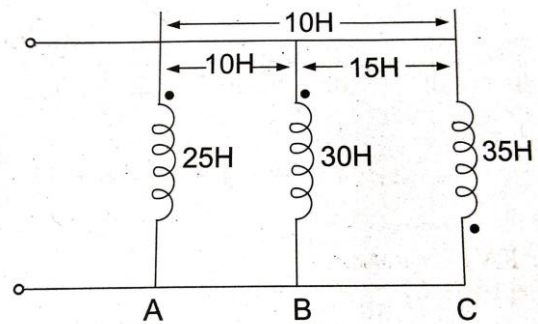


Figure 14

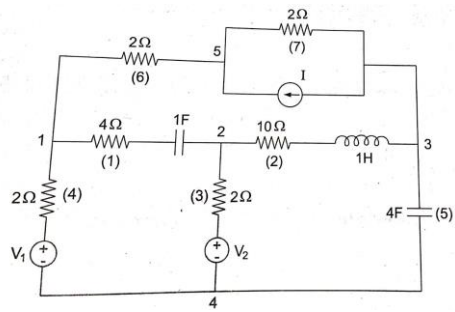


Figure 15
