Seat No.: _____ Enrolment No._____

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 conduction 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=∞.	**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≥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=1000Ω, L=1H, C=0.1μF 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≥ 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=0.5Ω and inductor L=0.25H as shown in figure 7 Obtain the expression of current i(t) for t≥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 procure 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 $f(t)=e^{-at}\sin(wt)$. **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**

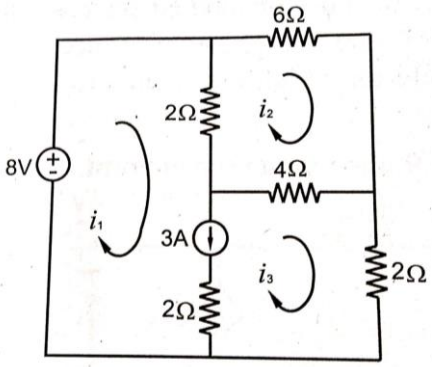

Figure 1

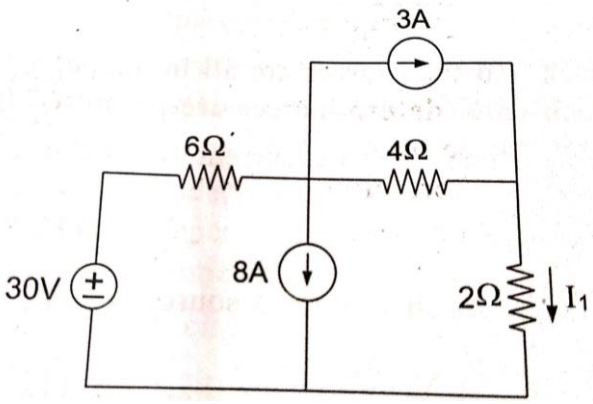

Figure 2

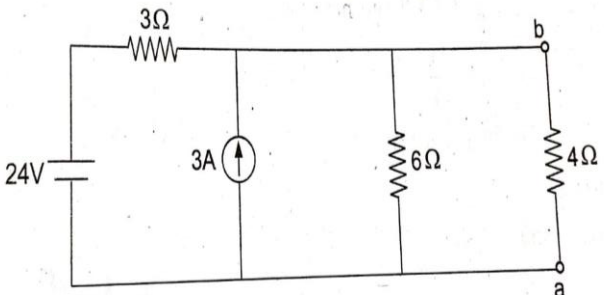

Figure 3

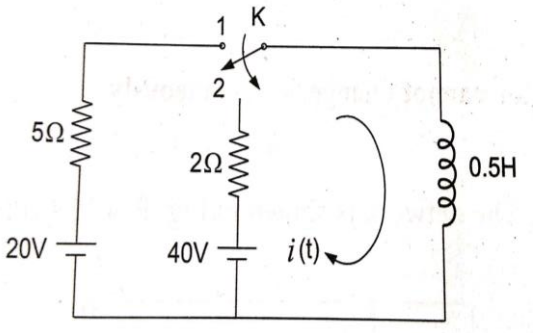

Figure 4

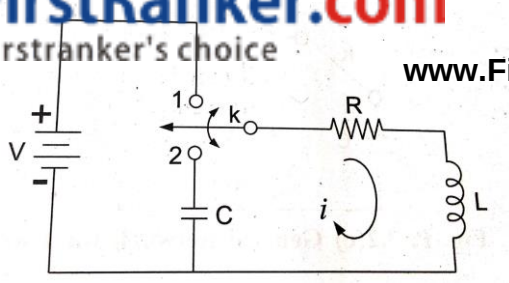

Figure 5

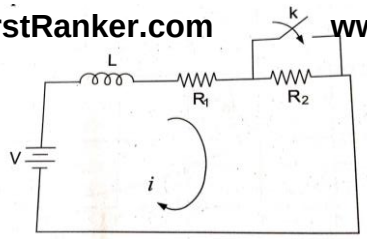

Figure 6

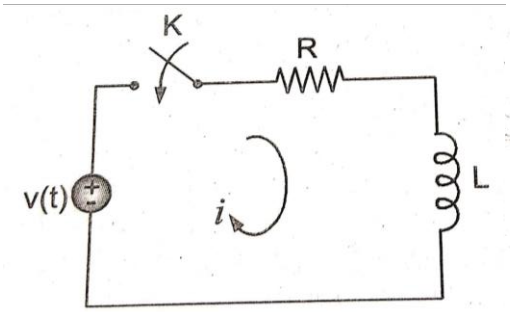

Figure 7

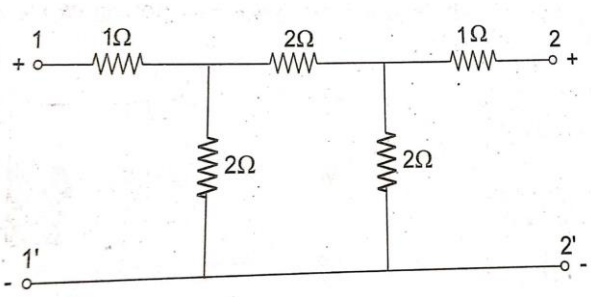

Figure 8

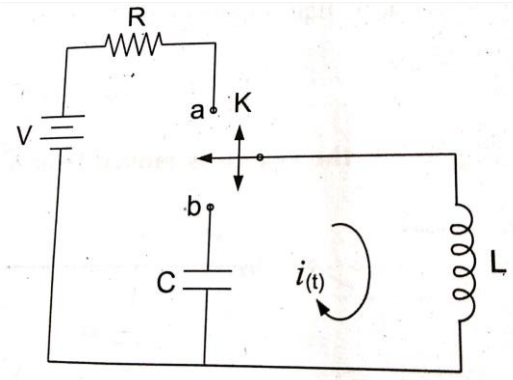

Figure 9

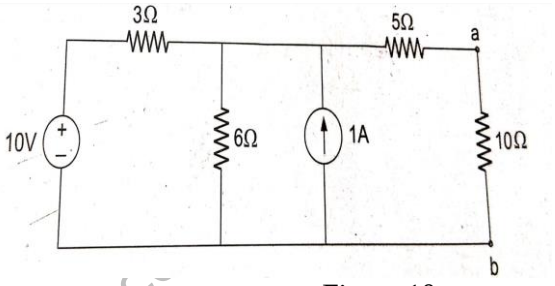

Figure 10

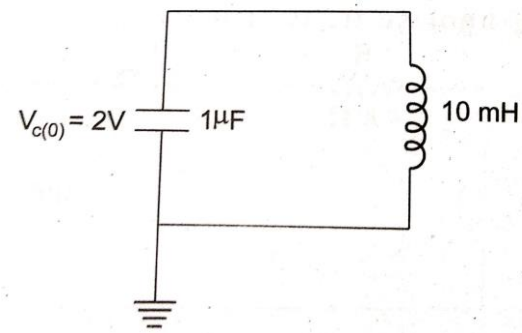

Figure 11

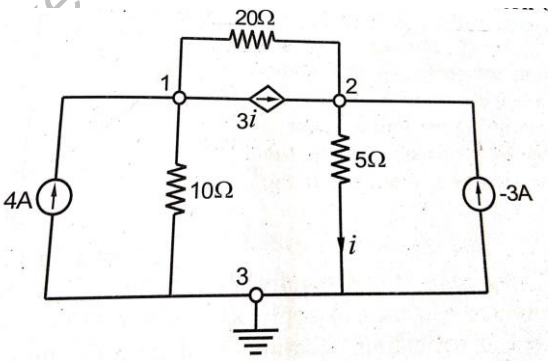

Figure 12

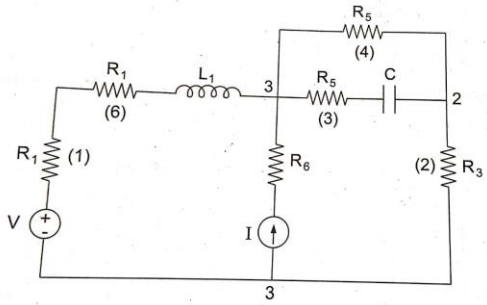

Figure 13

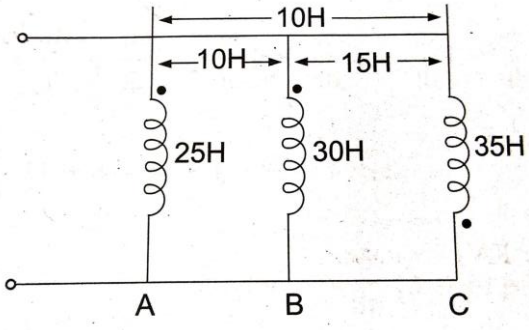

Figure 14

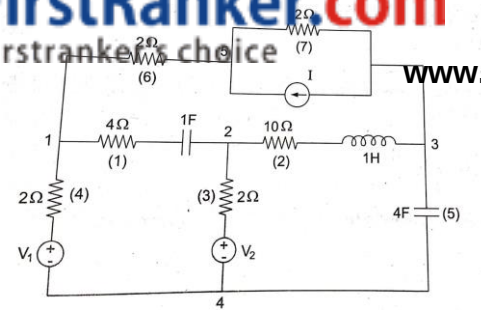

Figure 15

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