Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:3131103 Date:27-02-2023

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Differentiate between an open circuit and a short circuit. Draw their characteristics in v-i plane.	**03**
	(b)	Discuss the following: (1) Linear and Non-Linear elements (2) Bilateral and Unilateral elements (3) Active and Passive elements (4) Lumped and Distributed Networks.	**04**
	(c)	The figure:1 shows three windings on a magnetic core. Using different shaped dots, establish polarity markings for the windings, and write KVL equations for this network.	**07**
Q.2	**(a)**	How many types of controlled sources are possible? Draw their symbols.	**03**
	(b)	How are ideal current and voltage sources defined? Show the conversion of a voltage source into a current source and vice versa.	**04**
	(c)	Find the current I_1 and I_2 in the network of figure:2 using mesh analysis.	**07**
		OR	
	(c)	In the network of figure:3, use node analysis to determine $\boldsymbol{i_x}$.	**07**
Q.3	**(a)**	How the following elements will behave at t=0 and t=∞. (1) Resistance (2) Inductor (3) Capacitor.	**03**
	(b)	An exponential voltage $v(t) = 4\,e^{-5t}$ is applied at time t=0 to a series R-C circuit having R= 0.2Ω and C=1F. Obtain current $i(t)$ through the circuit.	**04**
	(c)	Explain how to obtain the transient response of a first order system using an appropriate example.	**07**
		OR	
Q.3	**(a)**	What is time constant? What is its significance?	**03**
	(b)	Define the terms critical resistance, damping ratio, natural frequency and settling time for a series R-L-C circuit.	**04**
	(c)	In the network of figure:4, a steady state is reached with the switch k open. At t=0, the switch is closed. Find the voltage across capacitor for t>0.	**07**
Q.4	**(a)**	Obtain Laplace transform of (1) Unit Step function (2) Unit Ramp function (3) Unit Impulse function.	**03**
	(b)	State (1) Millman's theorem (2) Maximum Power Theorem.	**04**
	(c)	State and explain maximum power transfer theorem. Also derive the condition for maximum power transfer to the load for DC and AC circuit.	**07**
		OR	
Q.4	**(a)**	Obtain Laplace transform of $(1)u(t-a)(2)\,r(t-a)(3)\delta(t-a)$.	**03**

(b) State (1) Reciprocity Theorem (2) Superposition's theorem. **04**

(c) Find the Norton's equivalent circuit at the terminals A-B of the circuit shown in figure:5. **07**

Q.5 **(a)** Define (1) Graph (2) Cut –set (3) incidence matrix. **03**

(b) Test whether the following polynomial is Hurwitz or not : $s^3 + 4s^2 + 5s + 2$. **.04**

(c) (1) Determine y-parameters in terms of h-parameters. **07**
(2) Determine z-parameters in terms of h-parameters.

OR

Q.5 **(a)** Define (1) Oriented graph (2) Tieset matrix (3) Node. **03**

(b) Determine the range of values of 'K' so that the polynomial $P(s) = s^3 + 3s^2 + 2s + K$ is Hurwitz. **04**

(c) (1) Determine h-parameters in terms of z-parameters. **07**
(2) Determine h-parameters in terms of y-parameters.

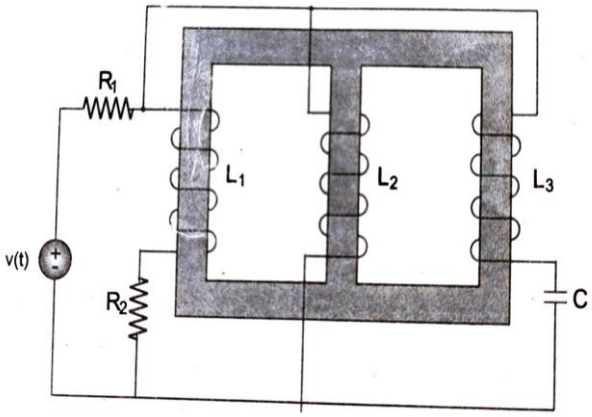

Figure:1

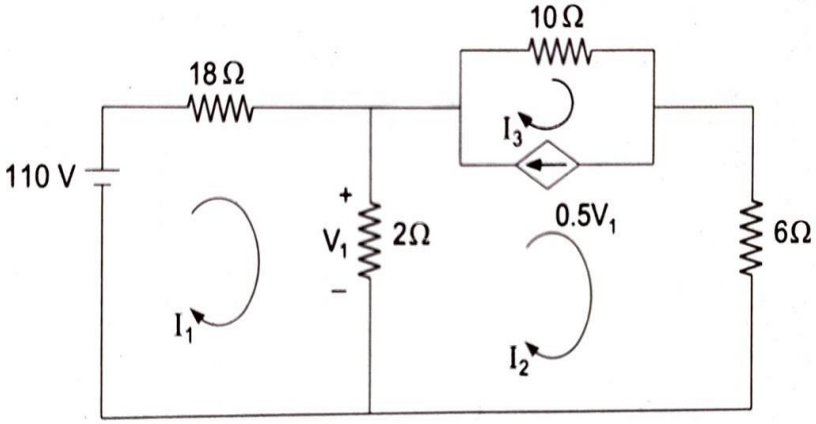

Figure:2

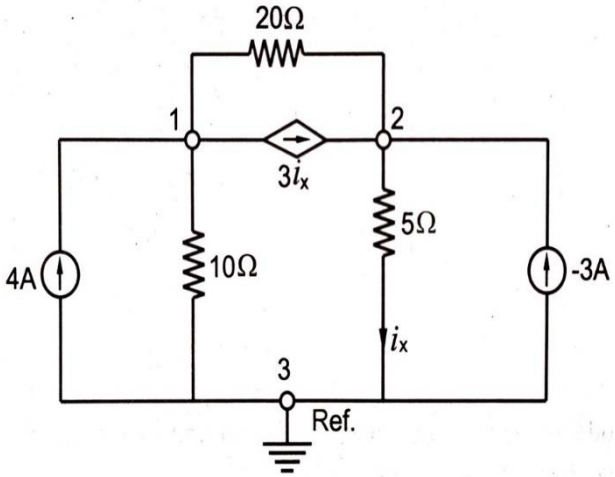

Figure:3

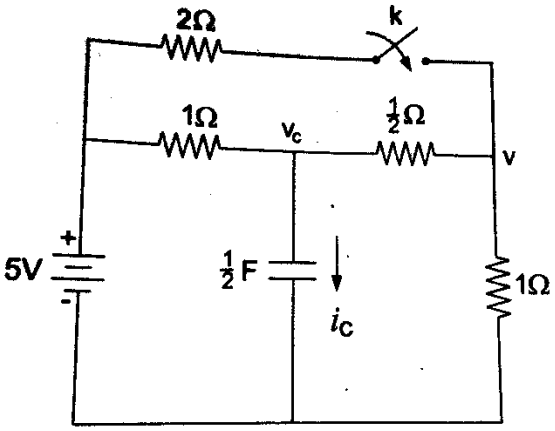

Figure:4

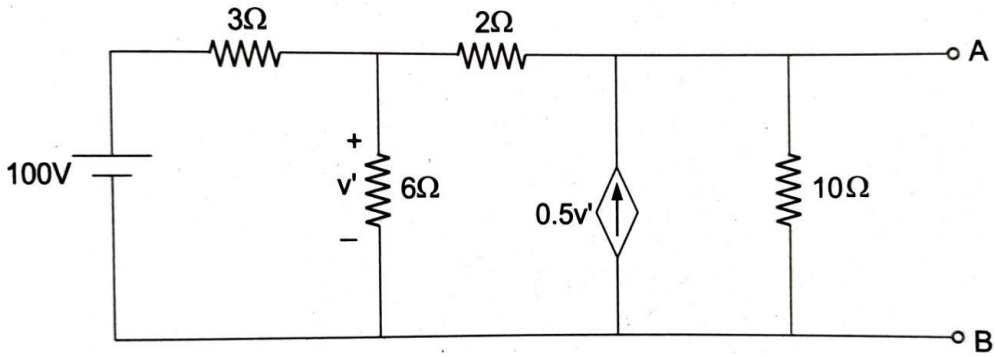

Figure:5