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 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.

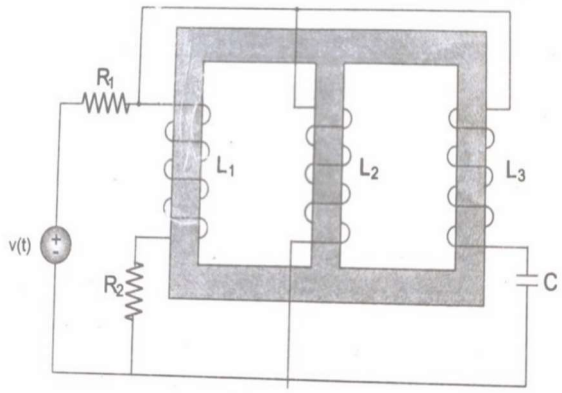

Figure:1

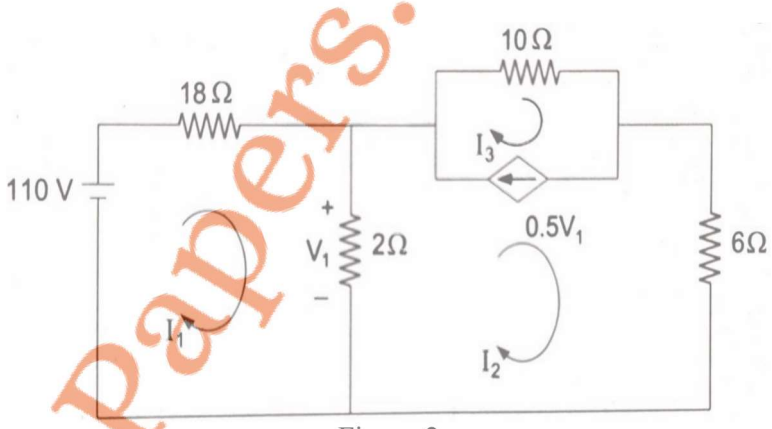

Figure:2

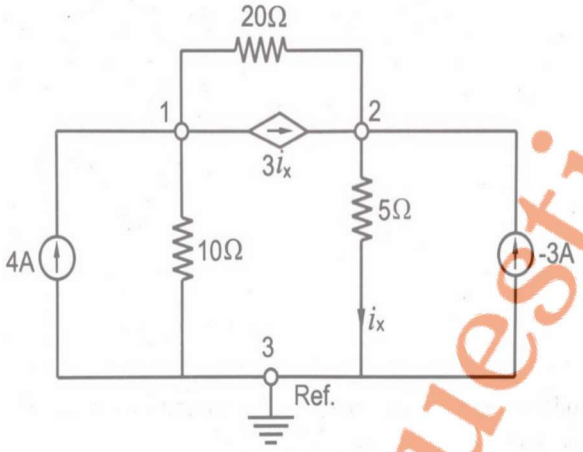

Figure:3

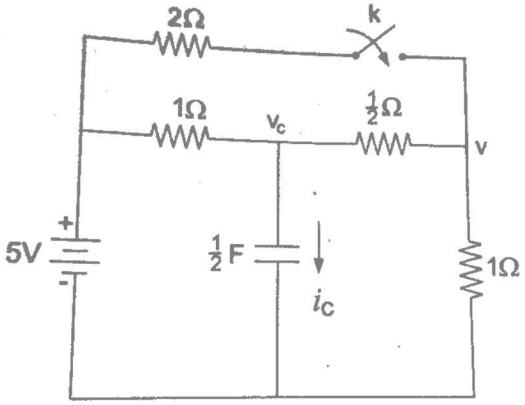

Figure:4

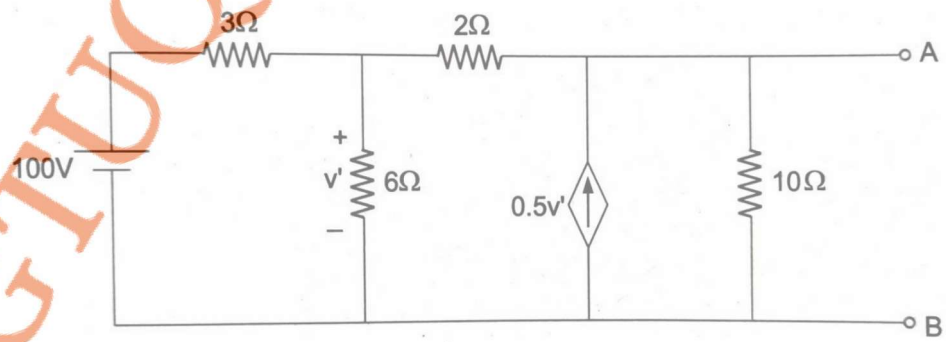

Figure:5