

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2024****Subject Code:3132406****Date:29-11-2024****Subject Name: Circuit Theory****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.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define with respect to electric circuit & network: (i) Node (ii) Tree & Co tree. (iii) Graph	03
	(b) What are the network elements and how it responds when electric energy supplied?	04
	(c) Discuss concept of duality and dual networks with suitable example.	07
Q.2	(a) Write and explain Thevenin's Theorem	03
	(b) Explain maximum power transfer theorem with the help of circuit network. Derive the equation of maximum power for AC circuits. Also give the condition for maximum power transfer.	04
	(c) Determine current flowing through $5\ \Omega$ resistance for the network shown in Fig. 1 using Norton's theorem.	07
	OR	
	(c) Write and explain Superposition Theorem. Determine current flowing through $5\ \Omega$ resistance for the network shown in Fig. 1 using superposition Theorem	07
Q.3	(a) Mention the initial and final condition for R, L & C components in the different cases.	03
	(b) Write the conditions for reciprocity and symmetry for Z-parameters	04
	(c) In the circuit of Fig.2, the switch is closed at $t=0$, $R=1\ \text{K}\Omega$, $C=100\ \mu\text{F}$. Capacitor is initially charged to $V_c=24\ \text{V}$. If the expression for current in the circuit is $i(t) = -0.024e^{-10t}$, sketch $i(t)$ and $v_c(t)$ for $t \geq 0$.	07
	OR	
Q.3	(a) Give the complete statement of compensation theorem with relevant equivalent circuit.	03
	(b) Explain in brief steady and transient response.	04
	(c) Illustrate the transient and steady state portion of the solution to a given network in Fig. 3 When switch moved from position "b" to "a" at $t = 0$. Find the expression for current.	07
Q.4	(a) Derive y- parameters in terms of z-parameters.	03
	(b) Write short notes on poles and zeros of network functions.	04
	(c) Apply nodal analysis for the network shown in Fig. 1 And find current across $5\ \Omega$ resistor.	07
	OR	
Q.4	(a) Discuss interconnections of two port networks.	03
	(b) Discuss relationship of two port variables. Define possible types of parameters.	04
	(c) Explain the concept of phasor of a sinusoidal waveform. Also explain rectangular, polar and exponential forms of phasor representation.	07

- Q.5 (a) State and explain : The Initial and Final Value Theorem. 03
 (b) Explain the various techniques of Source Transformation 04
 (c) In the RL circuit shown in Fig.4, the switch is in position 1 long enough to establish steady-state conditions, and at $t=0$ it is switched to position 2. Find the resulting current using Laplace transform technique. 07

OR

- Q.5 (a) Discuss: Types of Energy Sources. 03
 (b) Compute the ABCD-parameters of a two port network if its Z-parameters $Z_{11}=5\Omega$, $Z_{22}=4\Omega$, $Z_{21}=3\Omega$, $Z_{12}=3\Omega$ are 04
 (c) Explain hybrid parameters and also derive conditions of reciprocity and symmetry. 07

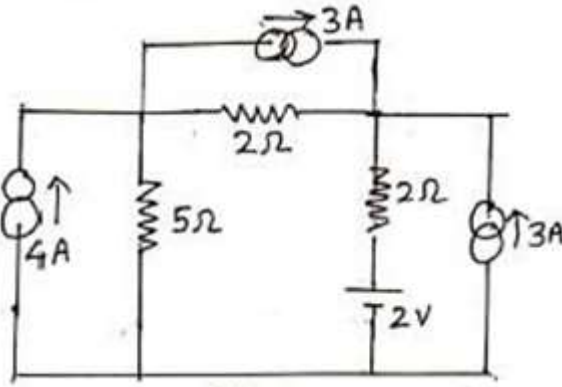


FIG-1

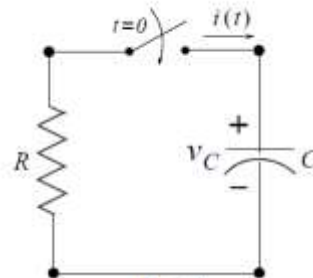


FIG-2

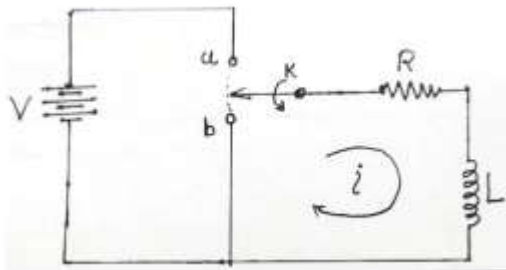


FIG-3

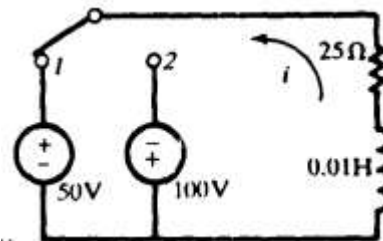


FIG-4
