

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022****Subject Code:3130906****Date:22-02-2023****Subject Name:Electrical Circuit Analysis****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.

		<b>Marks</b>
<b>Q.1</b>	(a) State and explain Reciprocity theorem.	<b>03</b>
	(b) What is the significance of Maximum Power transfer theorem? State and explain with example.	<b>04</b>
	(c) Determine the value of the voltage across $30\Omega$ resistor using super position theorem for the network of figure-1.	<b>07</b>
<b>Q.2</b>	(a) Find the current through the resistors shown in the network of Figure-2.	<b>03</b>
	(b) Determine the voltage across $4\Omega$ resistor using Thevenin theorem for the network of Figure-3.	<b>04</b>
	(c) Determine the node voltages for the circuit shown in Figure-4.	<b>07</b>
<b>OR</b>		
	(c) Determine the voltage across $4\Omega$ resistor using mesh analysis for the network of Figure-5.	<b>07</b>
<b>Q.3</b>	(a) In the network of Figure-6, the switch k is closed at $t=0$ , a steady state having previously been attained. Find $i$ at $t=0+$ .	<b>03</b>
	(b) Explain time constant in case of series R-L and series R-C circuit.	<b>04</b>
	(c) In the network of Figure-7, a steady state is reached with the switch k open, at $t=0$ , the switch k is closed. Find $i(t)$ for the given values.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Draw the exact dual network for the network shown in Figure-8	<b>03</b>
	(b) Explain and derive the step response to R-L series circuit using Laplace Transformation method.	<b>04</b>
	(c) In the network of Figure-9, the switch k is open at time $t=0$ . Obtain particular solution for $v(t)$ . Assume zero initial condition.	<b>07</b>
<b>Q.4</b>	(a) Define poles and zeros of network function. Explain significance of poles and zeros in different network functions.	<b>03</b>
	(b) Determine the current flowing through the $3\Omega$ resistor using Norton theorem for the network of Figure-10.	<b>04</b>
	(c) In a series R-L-C circuit of Figure-11 the switch k is closed at time $t=0$ . Obtain particular solution for the current using laplace transform method. Assume zero initial conditions in the element.	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) Point out the relations between voltage and current for the following elements. (1) Resistor (2) Inductor.	<b>03</b>
	(b) Draw impedance triangle for R-L and R-C circuit and explain related terms.	<b>04</b>

- (c) Three phase coils each having a resistance of  $8\Omega$  and inductance of  $0.02\text{ H}$  are connected in delta to a three phase  $480\text{V}$ ,  $50\text{Hz}$  supply. Calculate line current, phase current and power absorbed. **07**

- Q.5** (a) Determine the Y-Parameter of a two port network from the given open circuit Impedance parameters  $Z_{11} = 5\Omega$ ,  $Z_{12} = 3\Omega$ ,  $Z_{21} = 3\Omega$ ,  $Z_{22} = 4\Omega$ . **03**

- (b) Derive expression of ABCD parameters in terms of Z parameters. **04**

- (c) Determine Z-parameters of the circuit shown in Figure-12. **07**

**OR**

- Q.5** (a) Obtain condition for reciprocity and symmetry of a two port network in terms of Y-parameters. **03**

- (b) A two port network is represented by following equations: **04**

$$V_1 = 24 I_1 + 8 I_2$$

$$V_2 = 8 I_1 + 32 I_2$$

Determine h- parameter.

- (c) Determine transmission parameters of the circuit shown in Figure-13. **07**

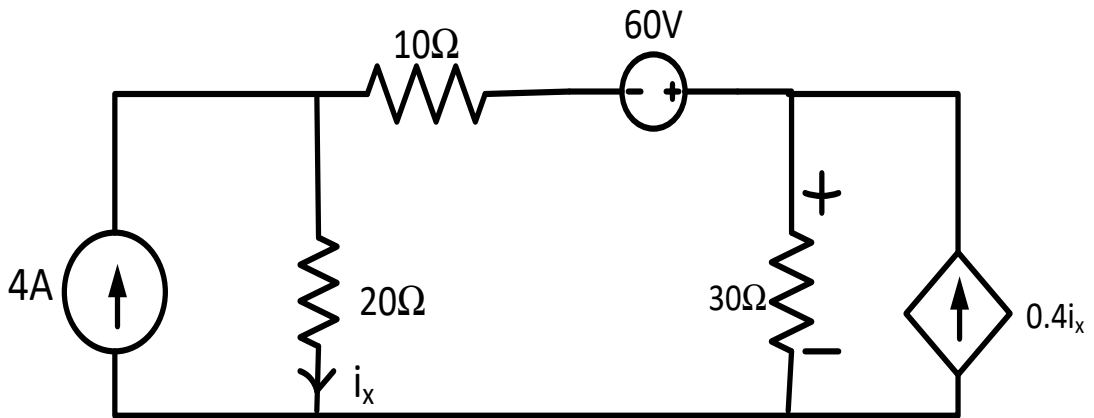


Figure-1

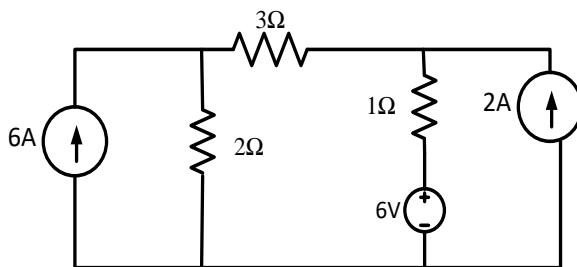


Figure-2

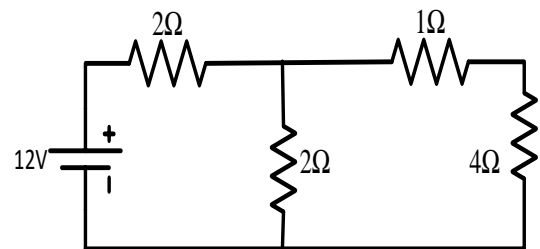


Figure-3

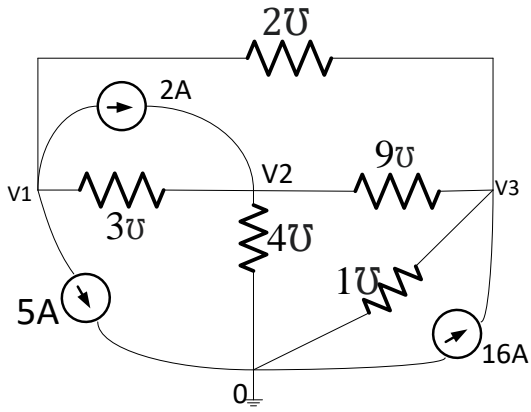


Figure-4

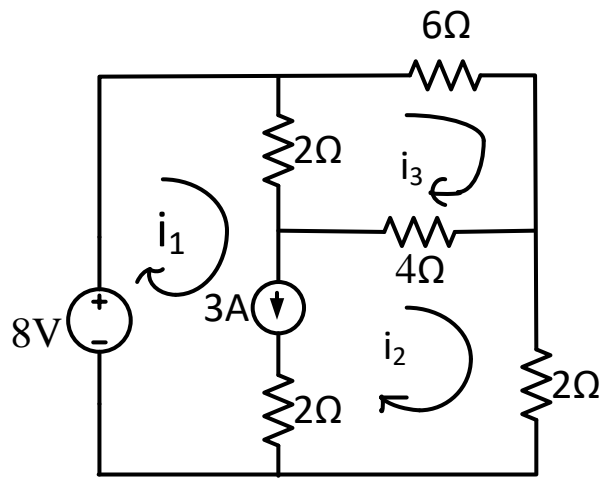


Figure-5

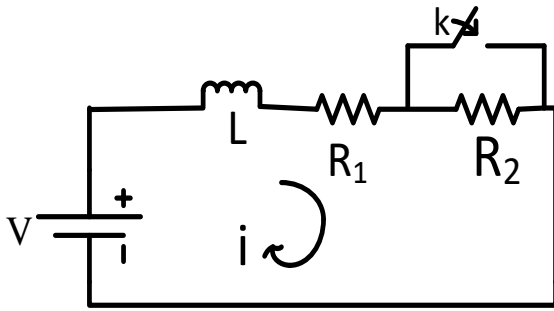


Figure-6

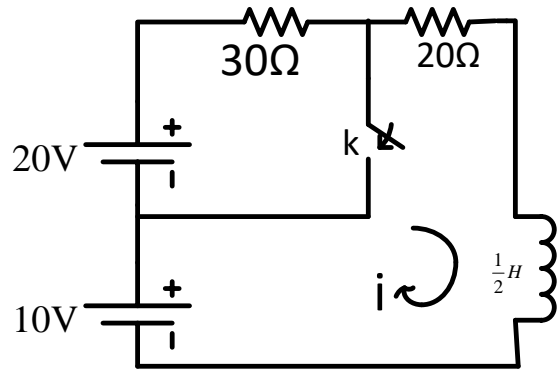


Figure-7

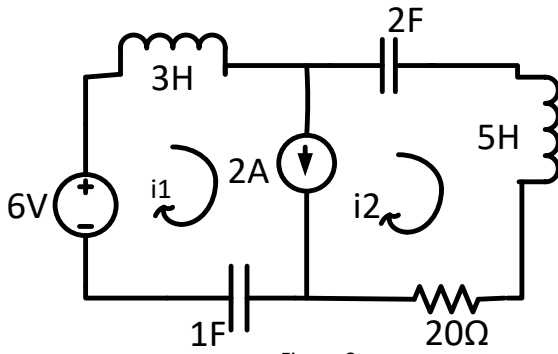


Figure-8

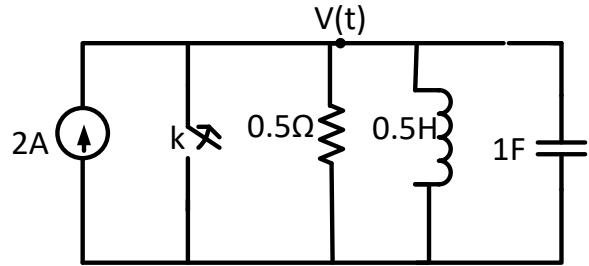


Figure-9

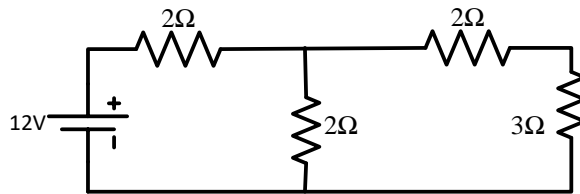


Figure-10

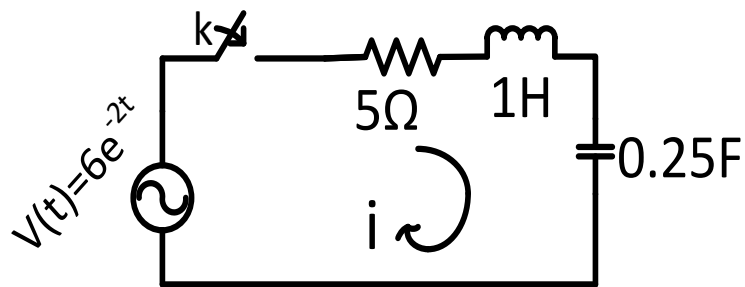


Figure-11

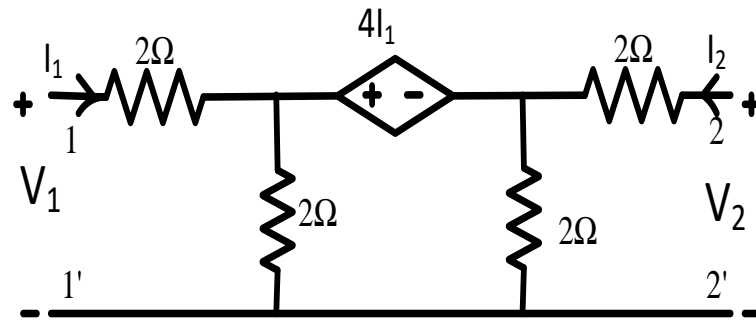


Figure-12

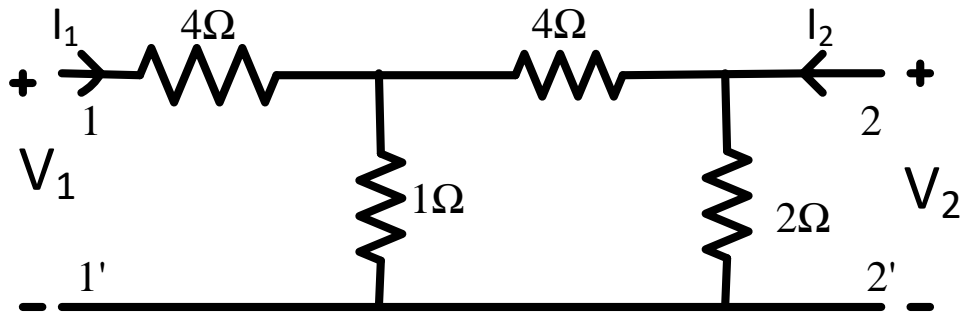


Figure-13