

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER– III EXAMINATION – SUMMER 2026****Subject Code:3130906****Date:17-06-2026****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.

		MARKS
Q.1	(a) State Thevenin and Norton theorem.	03
	(b) Discuss short-circuit admittance parameters and draw equivalent circuit for short circuit admittance parameters.	04
	(c) In the network shown in fig.1, contains two voltage sources V_1 and V_2 . With $V_1=30\angle 0^\circ$ V, Calculate V_2 such that the current in the $2+j3\ \Omega$ impedance is zero.	07
Q.2	(a) In the circuit shown in fig.2, a dc voltage suddenly applied to a series circuit. The inductor and capacitor are initially uncharged. Determine the particular solution for current $i(t)$ in the circuit.	03
	(b) Describe maximum power transfer theorem and write different conditions for maximum power transfer theorem for AC circuits.	04
	(c) Explain Superposition theorem with suitable example.	07
	OR	
	(c) Explain Reciprocity theorem with suitable example.	07
Q.3	(a) Elaborate series-parallel connection for two-port network.	03
	(b) Define Kirchhoff Voltage Law and Kirchhoff Current Law with suitable example.	04
	(c) In the network shown in fig.3, a steady state is reached with the switch k open. At time $t=0$. Switch k is closed. For the element values given, Figure out the values $V_a(0^-)$ and $V_a(0^+)$.	07
	OR	
Q.3	(a) Explain parallel-parallel connection for two-port network.	03
	(b) List difference between ideal and practical voltage source and Describe about source transformation.	04
	(c) In the network shown in fig.4, the switch k is moved from position 1 to 2 at $t=0$ a steady state having previously been attained. Find out $d^2i/dt^2(0^+)$ at $t=0^+$.	07
Q.4	(a) Explore the dual of the network shown in Fig.5.	03
	(b) In the network shown in fig.6, a steady state is reached with the switch k open. At $t=0$ the switch k is closed, Compute $i(t)$ for the numerical values given.	04
	(c) In the network of fig.7, the switch k is opened at time $t=0$. Evaluate the particular solution for voltage $v(t)$ across the parallel circuit using Laplace transformation. Assume that there is no charge across the capacitor C and no current in the inductor L before switching.	07
	OR	
Q.4	(a) In the two mesh network shown in fig.8, Identify the mesh currents I_1 and I_2 .	03
	(b) In the network shown in fig.9, the network attains a steady state, and at $t=0$, the switch is closed. Calculate $V_a(t)$ for $t \geq 0$.	04

- (c) In a series R-L-C circuit, $R=5\Omega$, $L=1\text{H}$ and $C=0.25\text{ F}$ and $v(t) = 8e^{-2t}$ Volts. Switch k is closed at time $t=0$. Evaluate particular solution for the current using Laplace transform method. Assume zero initial conditions in the elements. 07

- Q.5** (a) Find out reciprocity condition for g-Parameters. 03
 (b) Generalize relationship of h-parameter to z-parameters. 04
 (c) For the network shown in fig.10, the switch k is closed at time $t=0$. Capacitor C is initially charged to V_0 volts. Using Laplace transformation method, discover the expression for the current $i(t)$. 07

OR

- Q.5** (a) Find out symmetry condition for inverse ABCD-parameters 03
 (b) Generalize relationship of ABCD-parameters to y-parameters. 04
 (c) In R-L circuit shown in fig.11, the switch is in position 1 long enough to establish steady state conditions and at $t=0$ is switched to position 2. Discover the expression for the current in the circuit using Laplace transform. 07

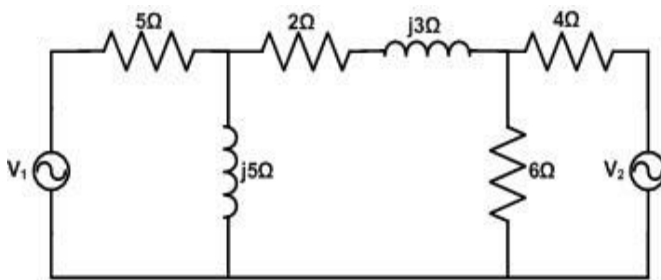


Fig.01

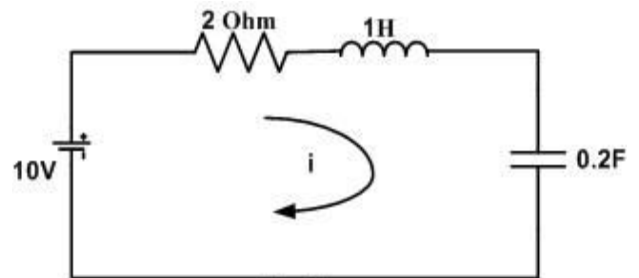


Fig.2

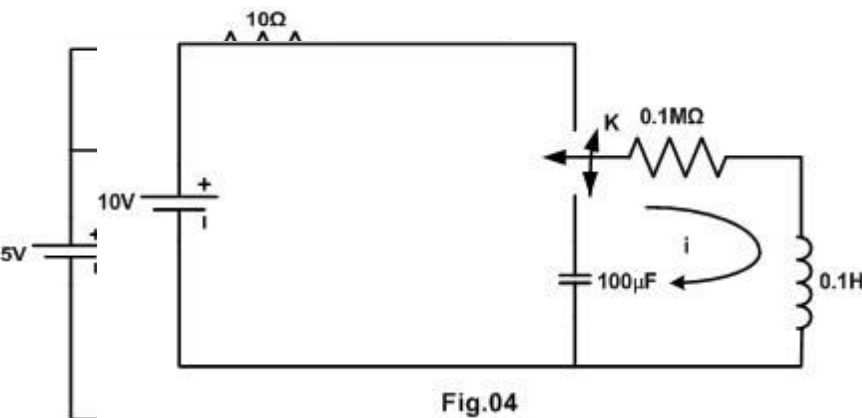


Fig.04

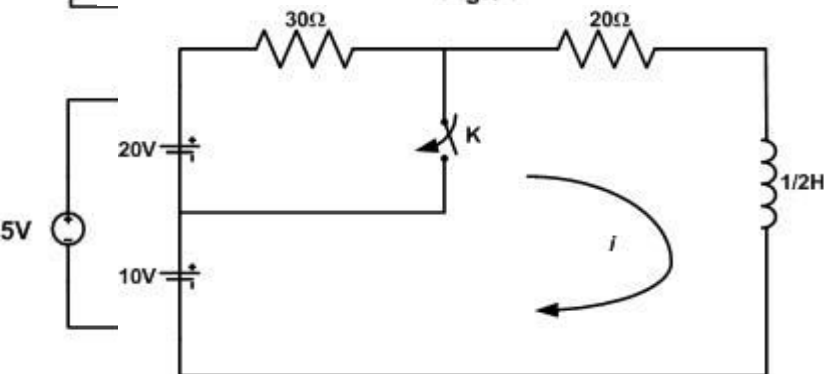
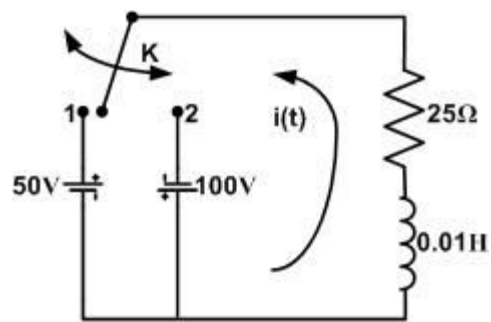
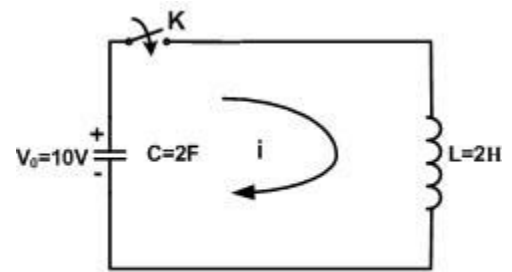
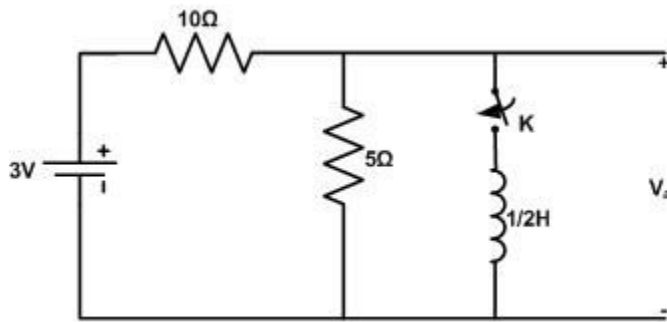
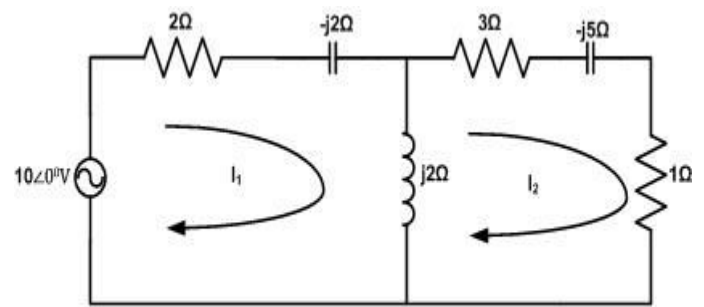
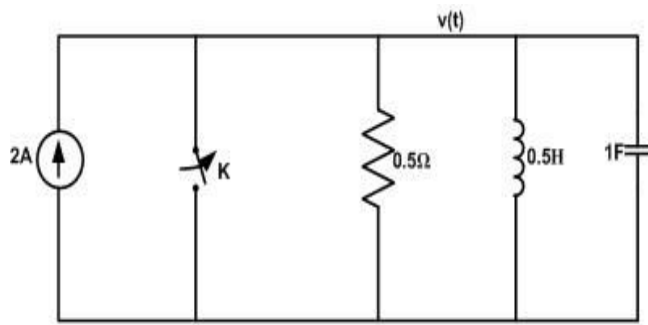


Fig.06



GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III EXAMINATION – SUMMER 2025****Subject Code:3130906****Date:29-05-2025****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.

		MARKS
Q.1	(a) State and explain Superposition theorem for analysis of electrical circuits.	03
	(b) State and explain Thevenin's theorem for analysis of electrical circuits.	04
	(c) In the circuit of fig. 1, determine the value of R_L for which the power dissipated in R_L will become maximum. Also find the value of $P_{\max}$.	07
Q.2	(a) Define Z-parameters for a two port network and draw equivalent circuit of the network in terms of Z-parameters.	03
	(b) Derive Y-parameters as functions of Z-parameters.	04
	(c) In the circuit shown in fig. 2, use mesh analysis to determine the current through $10\ \Omega$ resistance.	07
	OR	
	(c) Calculate Z-parameters for the two port network shown in fig. 3.	07
Q.3	(a) Give reasons for the following. (i) The current through an inductor cannot change instantaneously (ii) The voltage across a capacitor cannot change instantaneously	03
	(b) In the circuit shown in fig. 4, steady state is achieved with the switch S open. Now, the switch closes at time $t = 0$. Determine the values of i , di/dt and d^2i/dt^2 at time $t = 0^+$.	04
	(c) In the circuit shown in fig. 5, the switch closes at time $t = 0$. Solve the circuit and find the value of capacitor voltage at time $t = 5$ second. Assume that the capacitor is initially uncharged.	07
	OR	
Q.3	(a) Two mutually coupled inductors are connected in series as shown in fig. 6. The inductors have self-inductances $L_1 = 3\text{ H}$ and $L_2 = 5\text{ H}$ respectively and a mutual inductance $M = 2\text{ H}$. If the polarity markings are as shown by dots on the diagram, find equivalent inductance of the series connection.	03
	(b) Define and explain the term 'Time Constant' with reference to (i) R-L circuit. (ii) R-C circuit	04
	(c) A series R-L-C circuit with $R = 9\ \Omega$, $L = 1\text{ H}$ and $C = 0.05\text{ F}$ is energized by a source of constant d.c. voltage $V = 20\text{ V}$ by closing a switch at time $t = 0$. Assuming that the capacitor is initially uncharged, find particular solution for current $i(t)$ through the circuit.	07
Q.4	(a) Derive Laplace transform of the function $f(t) = \frac{di}{dt}$	03
	(b) Derive step response of a series R-C circuit using Laplace transform.	04

(c) Using Laplace transformation, solve the following differential equation.

07

$$\frac{d^2 i}{dt^2} + 2 \frac{di}{dt} + 5i = 4e^{-t}$$

It is given that $i(0+) = 3$ and $\frac{di}{dt}(0+) = -3$.

OR

Q.4 (a) Draw transform networks of the following elements.

03

(i) Inductor with initial current $i_L(0-)$

(ii) Capacitor with initial voltage $v_C(0-)$

(b) Explain the difference between Zero Radian frequency and Zero Neper frequency.

04

(c) For the LC network shown in fig. 7, determine the transform impedance $Z(s)$ and plot poles and zeros of this network function.

07

Q.5 (a) Explain the following term in relation to single phase a.c. circuits. (1) RMS Value (2) Active Power (3) Power Factor

03

(b) In the circuit shown in fig. 8, an unknown impedance of $Z \Omega$ is connected in series with a $(5 + j8) \Omega$ coil. If $I = 2.5 \angle -150^\circ$ A, find value of Z .

04

(c) A Δ -connected load having $Z_{RY} = j10 \Omega$, $Z_{YB} = 10 \angle 0^\circ \Omega$ and $Z_{BR} = -j10 \Omega$ is being supplied from a balanced 100 V, 50 Hz, 3-phase supply. Determine (i) Phase Currents and (ii) Line Currents

07

OR

Q.5 (a) Discuss Resonance in series R-L-C circuits.

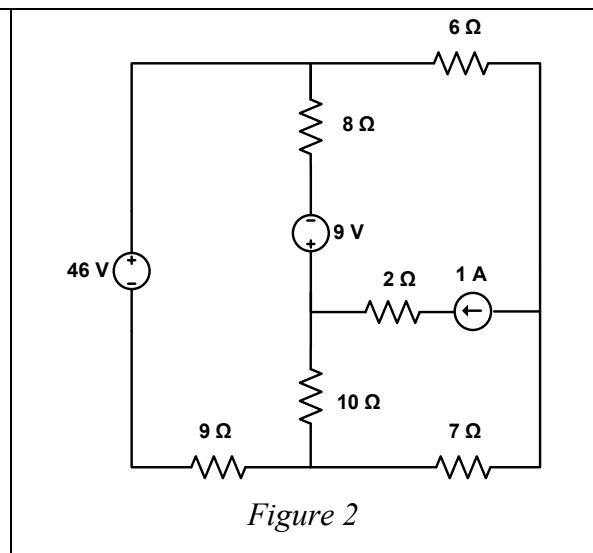
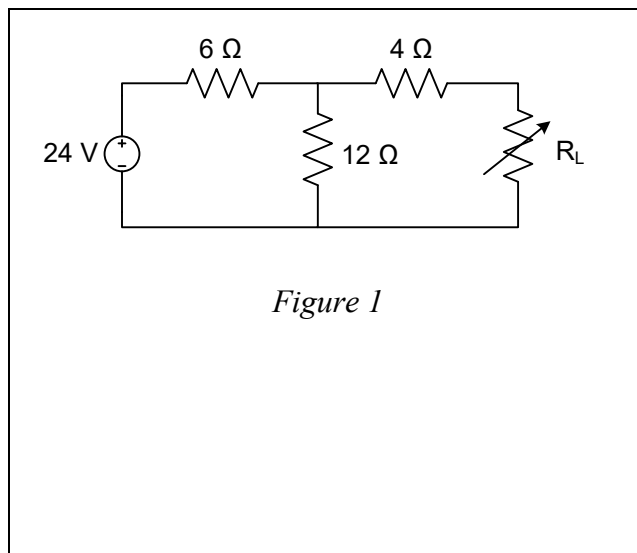
03

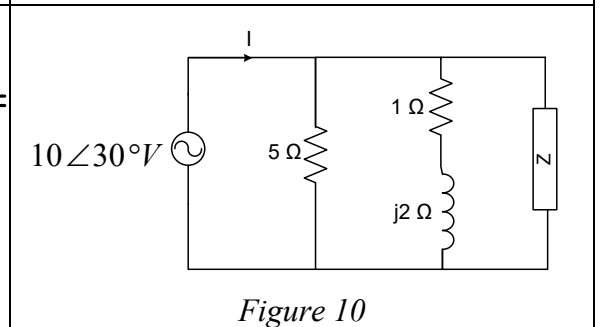
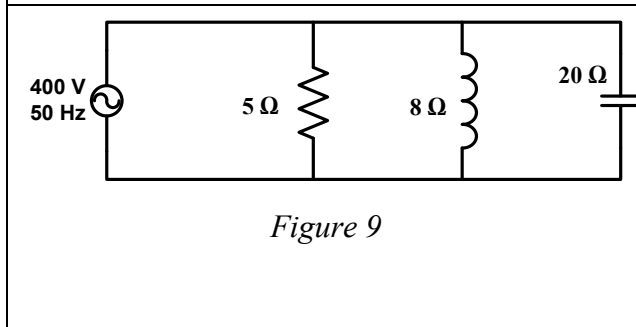
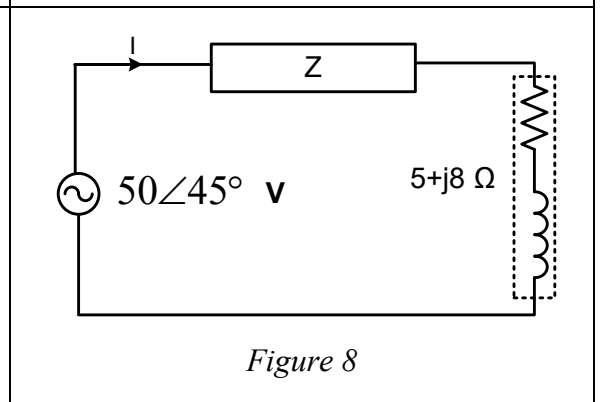
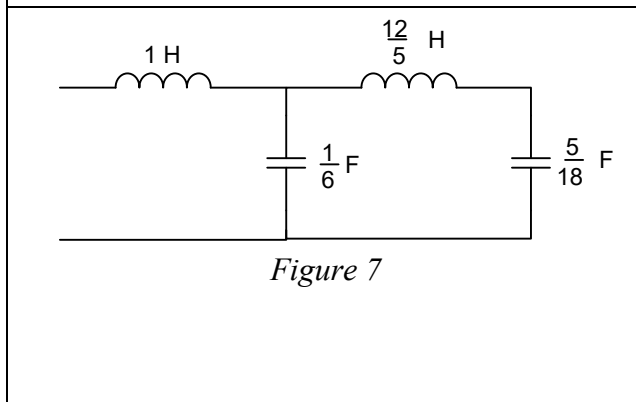
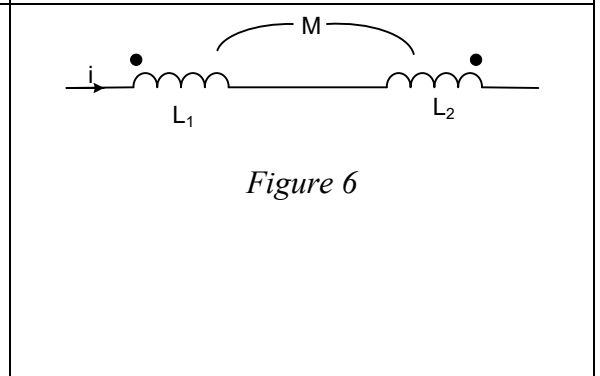
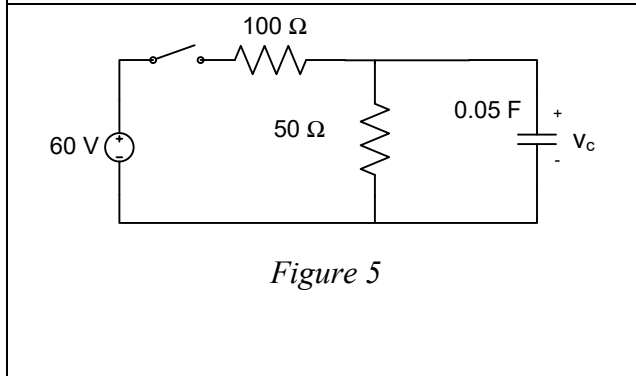
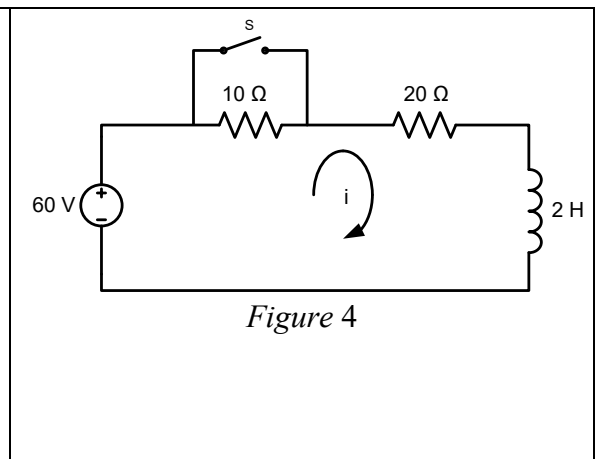
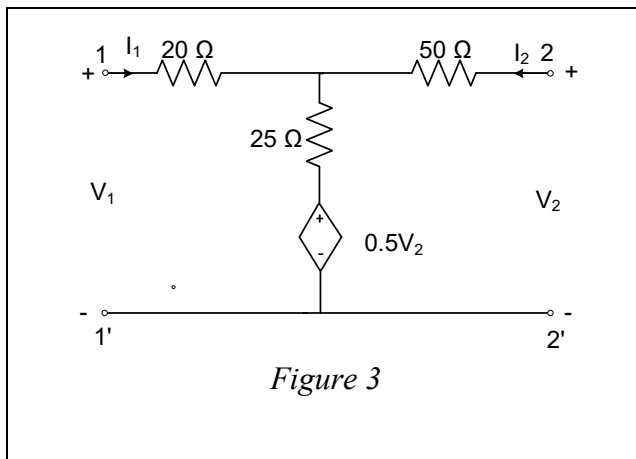
(b) In the circuit shown in fig. 9, find the current drawn from the source.

04

(c) In the circuit of fig 10, if current $I = 5 \angle 60^\circ$ A, find Z .

07





GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2024****Subject Code:3130906****Date:19-07-2024****Subject Name: Electrical Circuit Analysis****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) State and explain Superposition theorem.	03
	(b) Explain Norton's theorem.	04
	(c) Find the value of load resistance when maximum power is transferred across it and also find the value of maximum power transferred for the network of the circuit shown in Figure 1.	07
Q.2	(a) Explain the initial condition in different passive electrical elements. What is the importance of initial conditions in network analysis?	03
	(b) State and explain Maximum power transfer theorem with suitable example.	04
	(c) For the circuit shown in Figure 2 switch K is changed from position a to b at $t=0$, steady state condition having been reached before switching. Find the values of i ; di/dt , d^2i/dt^2 at $t = 0^+$.	07
	OR	
	(c) Explain in detail about transient response in series R-C circuit having DC excitation.	07
Q.3	(a) What is time constant? What is its significance?	03
	(b) Explain the importance of Dot convention in coupled circuit with suitable example.	04
	(c) Explain and derive the step response to R-L series circuit using Laplace Transformation method.	07
	OR	
Q.3	(a) In terms of two terminal elements, define: 1) Unilateral elements, 2) Passive elements, 3) Time-variant elements.	03
	(b) Define unit ramp function. Obtain Laplace transform of unit ramp function.	04
	(c) Find the value of voltage across R_3 resistance of figure 3 using Nodal Analysis.	07
Q.4	(a) Define H-parameter of a two-port network.	03
	(b) Derive expression of Y parameters in terms of Z parameters.	04
	(c) Find z parameters of the network shown in figure 4.	07

OR

- Q.4** (a) What is the condition of symmetry of all different two port parameters? **03**
 (b) Define the term Poles and Zeros with suitable example. **04**
 (c) Determine Y-parameters of the circuit shown in figure 5. **07**

- Q.5** (a) Define unit ramp function. Obtain Laplace transform of unit ramp function. **03**
 (b) Describe the solution of non-homogeneous differential equation for particular integral. **04**
 (c) Define poles and zeros of network function. Explain significance of poles and zeros in different network functions. **07**

OR

- Q.5** (a) Draw and explain the dependent controlled sources. **03**
 (b) Explain characteristic of an ideal voltage source. **04**
 (c) State the procedure to obtain solution of a network using Laplace transform method. State advantage of Laplace method over a classical method. **07**

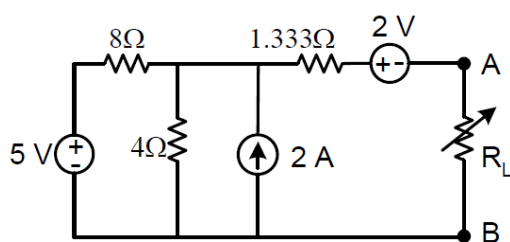


Figure.1

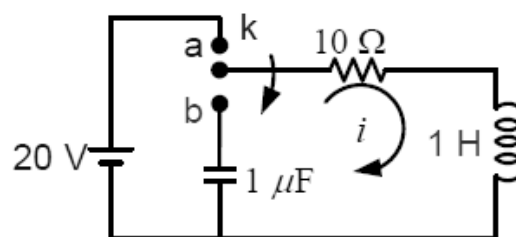


Figure.2

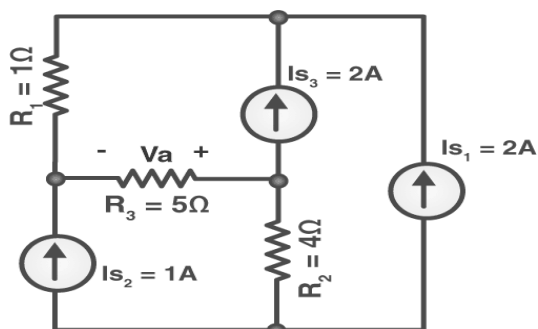


Figure.3

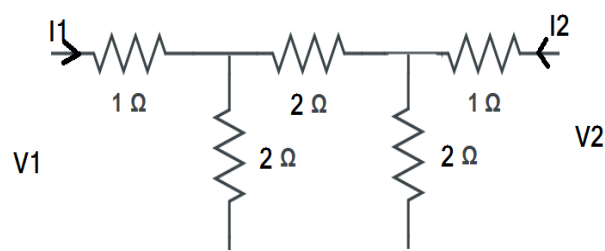


Figure.4

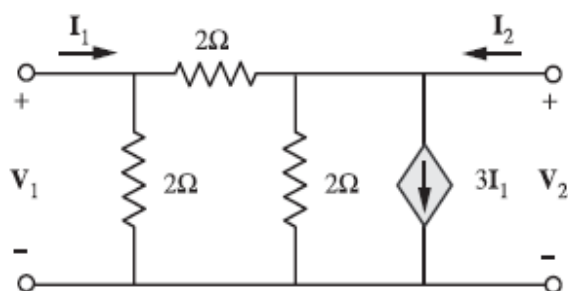


Figure.5

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III(NEW) EXAMINATION – SUMMER 2023****Subject Code:3130906****Date:26-07-2023****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.

		Marks
Q.1	(a) Enlighten the interpretation of “j” operator.	03
	(b) What do you mean by Unbalanced load? Derive the current equations for (i) unbalanced three wire star connected load (ii) Unbalanced delta connected load.	04
	(c) Calculate the voltage across 5Ω resistor using mesh analysis for a figure.1 .	07
Q.2	(a) Explain the concept of duality and derive the dual network for series RLC circuit shown in figure.2 .	03
	(b) State and Explain the super position theorem using suitable example.	04
	(c) Calculate the unknown node voltages V_1, V_2 and V_3 shown in figure.3 , using node analysis.	07
OR		
	(c) A Wheatstone bridge shown in figure.4 ABCD is arranged as follows: $AB = 10\Omega$, $BC = 30\Omega$, $CD = 15\Omega$ and $DA = 20\Omega$. A 2V battery of internal resistance 2Ω is connected between points A and C with A being positive. A galvanometer of resistance 40Ω is connected between B and D. Find the magnitude and direction of the galvanometer current as per given branch currents.	07
Q.3	(a) Prepare the table for equivalent branch of final conditions for R,L,C.	03
	(b) For a given figure.5 find out the $i_1(0+)$ and $i_L(0+)$, the network has been achieve the steady state at $t < 0$.	04
	(c) In the circuit shown in figure.6 , a 10 volt d.c.supply is suddenly applied to series circuit. The capacitor is initially uncharged. Obtain the particular solution for the current $i(t)$ in the circuit.	07
OR		
Q.3	(a) Prepare the table for equivalent branch of initial conditions for R,L,C.	03
	(b) In the network shown in figure.7 , K is closed at $t = 0$ with zero current in the inductor. Find the values $i, \frac{di}{dt}$, at $t=0+$, for $R=8\Omega$ and $L=$	04
	(c) In the network shown in figure.8 , a steady state is reached with switch k open. At $t=0$ switch k closed find out the $i(t)$ for the given numerical values and sketch the current transient.	07

- Q.4** (a) Give the importance of poles and zeros. **03**
 (b) Elaborate the zero radian frequency and zero Neper frequency. **04**
 (c) For a given **figure.9** inductor current and capacitor voltage is zero at $t=0^-$, so for a given network show that its generated current transform is **07**

$$I(S) = \frac{10(s^2+s+1)}{(s^2+1)(s^2+2s+1)}$$
- OR**
- Q.4** (a) Make a table for the transfer impedances for R,L and C. **03**
 (b) Calculate the step response for series R-C circuit for $t>0$ **04**
 (c) In the network shown in **figure.10** calculate the current $i(t)$, when $i_1(t)=7e^{-6t}$ A for $t\geq 0$, $i(0)=0$, also find out $i(\infty)$ using Laplace transforms. **07**
- Q.5** (a) Derive the condition for reciprocity for z-parameters. **03**
 (b) Derive relationship of z-Parameter in terms of ABCD Parameter **04**
 (c) For the network shown in **figure.11** calculate the y parameters. **07**
- OR**
- Q.5** (a) Derive the condition for reciprocity for ABCD parameters. **03**
 (b) Derive relationship of ABCD Parameter in terms of y-Parameters **04**
 (c) For the network shown in **figure.12** calculate the h- parameters. **07**

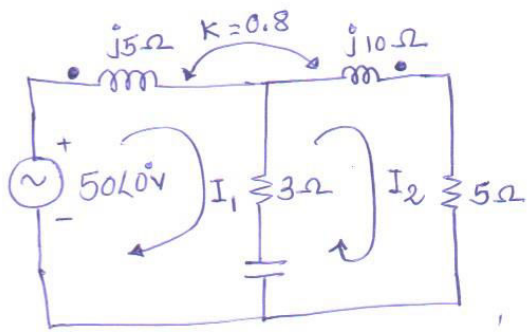


Figure. 1

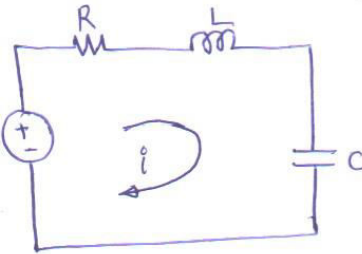


Figure-2

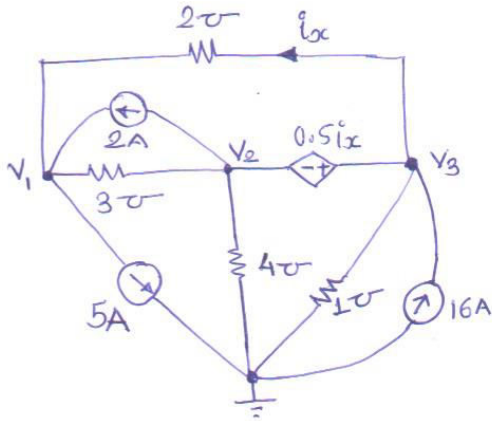


Figure. 3.

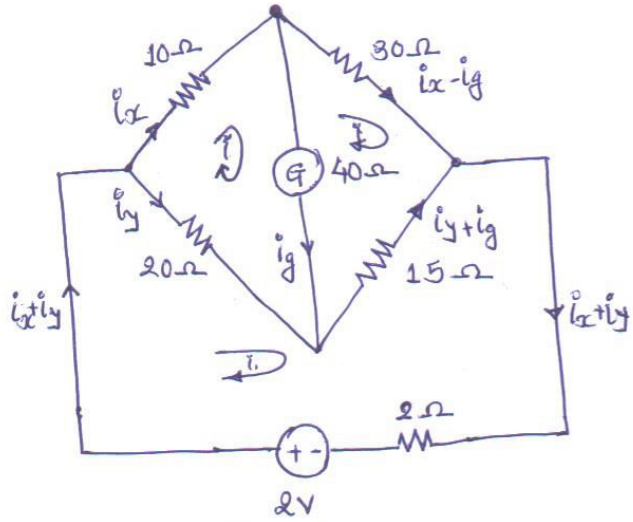


Figure. 4

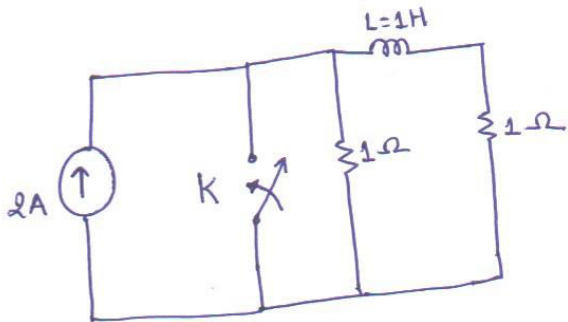


Figure. 5.

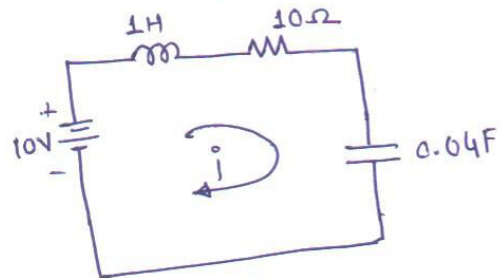


Figure. 6

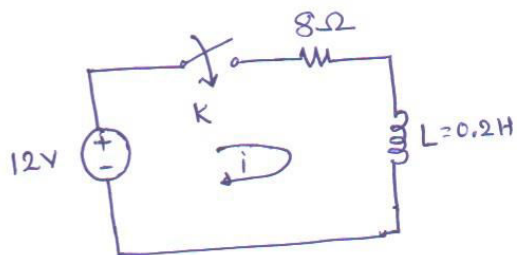


Figure. 7

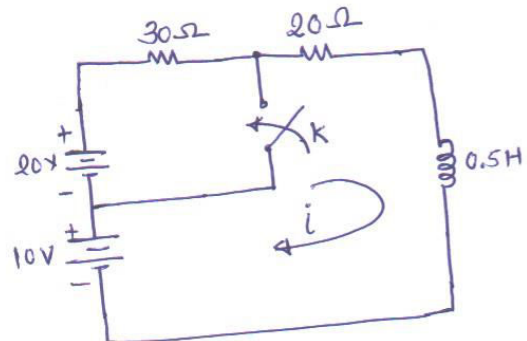


Figure. 8.

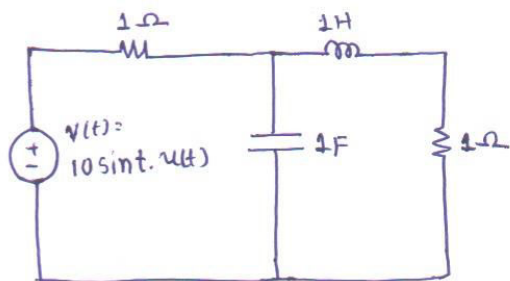


Figure. 9.

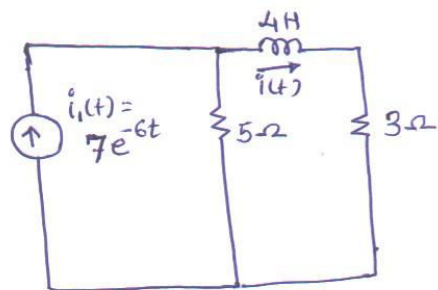


Figure. 10.

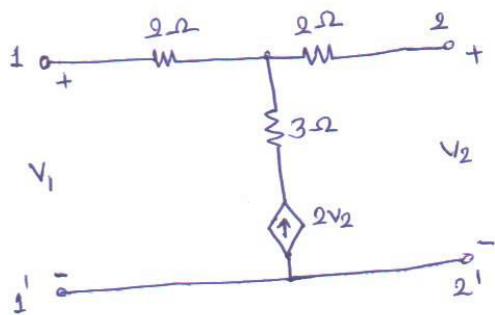


Figure. 11

