Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3130906 Date: 28/11/2019

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.**

			MARKS
Q.1	**(a)**	State and explain Reciprocity theorem.	**03**
	(b)	State and explain Maximum power transfer theorem with suitable example.	**04**
	(c)	Obtain Thevenin's equivalent resistance of the circuit given in fig.1 to the left of the terminals a-b.	**07**
Q.2	**(a)**	In the fig.2, the switch k is first kept at position 1 and steady state condition is reached. At t = 0, switch is moved to position 2. Find the current in both the cases.	**03**
	(b)	Explain time constant in case of series R-L and series R-C circuit.	**04**
	(c)	In the fig.3, the switch is closed at t = 0. Find value of i, di/dt, d^2i/dt^2 at $t=0^+$. Assume initial current of inductor to be zero.	**07**
		OR	
	(c)	Explain in detail about transient response in series R-C circuit having DC excitation.	**07**
Q.3	**(a)**	Explain the importance of Dot convention in coupled circuit with suitable example.	**03**
	(b)	Draw impedance triangle and explain related terms.	**04**
	(c)	For the network shown in fig.4, find the node current I using node voltage technique.	**07**
		OR	
Q.3	**(a)**	In the fig.5, an unknown impedance of Z Ω is connected in series with $(5 + j8)$ Ω coil. If $I = 2.5 \angle -15^0$ A, find value of Z.	**03**
	(b)	Find the current in a series R-L circuit having R = 2 Ω and L =10 H while a DC voltage of 100 V is applied. What is the value of this current after 5 seconds of switching on?	**04**
	(c)	The circuit shown in fig.6 is operating in the sinusoidal steady state. Find I_1 and I_2 by loop analysis and determine ratio V_0 / V_s. Assume $\omega = 10^3$ rad / sec.	**07**
Q.4	**(a)**	Find driving point impedance of the given network shown in fig.7.	**03**
	(b)	Find inverse Laplace of given F(s). $F(s) = \frac{(s+2)}{s\,(s+3)\,(s+4)}$	**04**
	(c)	Obtain the step response for the R-L series circuit shown in fig.8.	**07**
		OR	

Q.4	**(a)**	Explain characteristics of unit ramp function.	**03**
	(b)	Determine the transfer function $H(s) = V_0(s) / I_0(s)$ of the circuit in fig.9.	**04**
	(c)	Find $v_0(t)$ in the circuit of fig.10, assuming zero initial condition.	**07**
Q.5	**(a)**	What is the condition of symmetry of all different two port parameters?	**03**
	(b)	Briefly describe h parameters for a two port network.	**04**
	(c)	Obtain Z-parameters of the circuit shown in fig.11.	**07**

OR

Q.5	**(a)**	Find Y-parameters of the circuit shown in fig.12	**03**
	(b)	Derive expression of ABCD parameters in terms of Z parameters.	**04**
	(c)	Determine Z-parameters of the circuit shown in fig.13.	**07**

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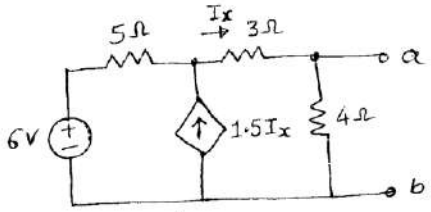

fig. 1

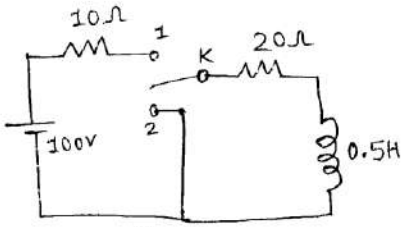

fig. 2

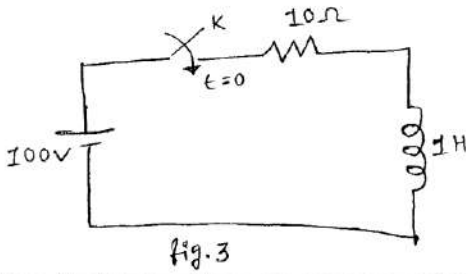

fig. 3

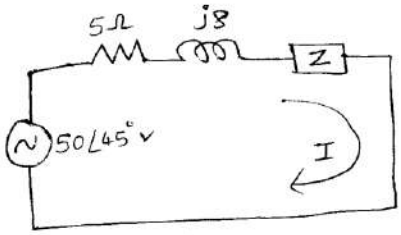

fig. 5

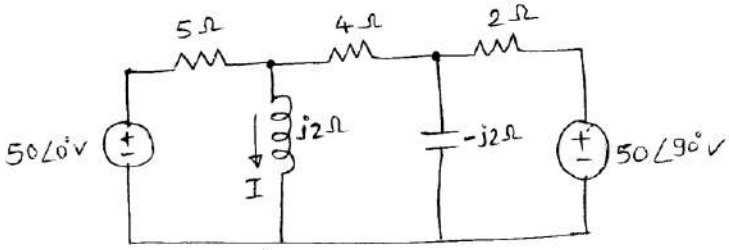

fig. 4

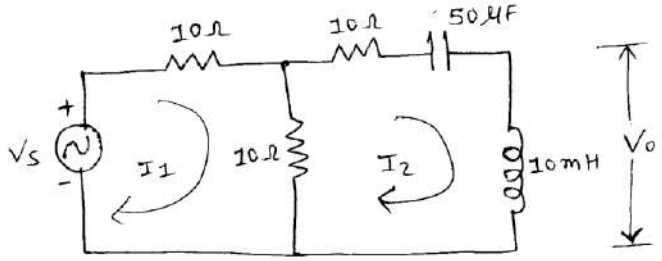

fig. 6

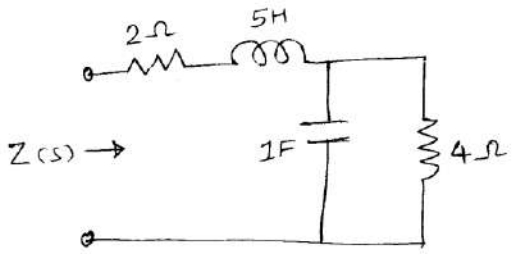

fig. 7

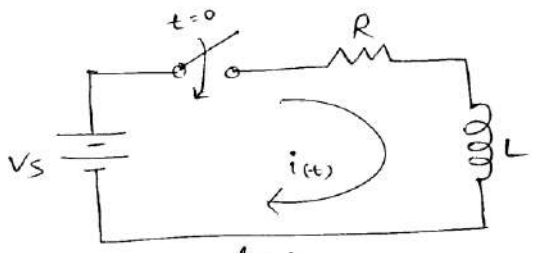

fig. 8

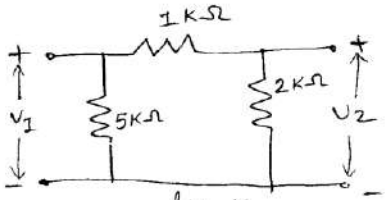

fig. 12

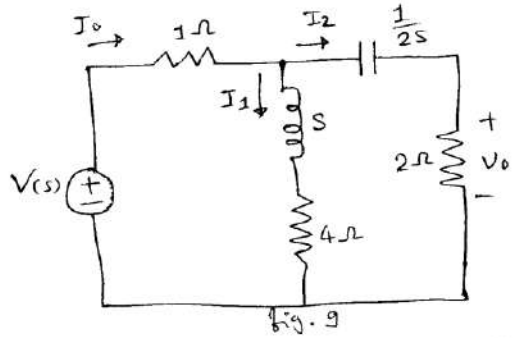

fig. 9

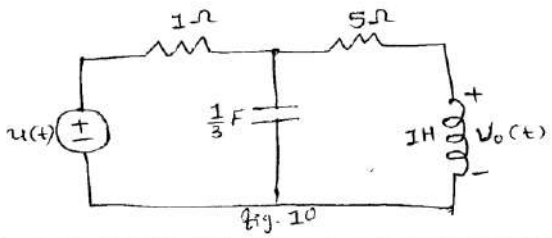

fig. 10

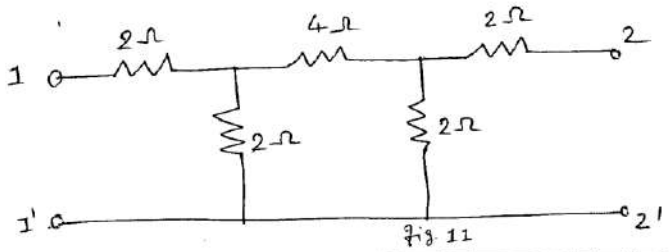

fig 11

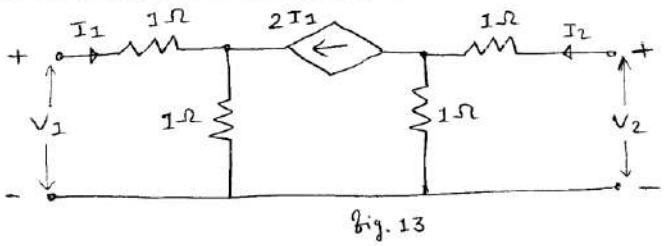

fig. 13

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2020

Subject Code:3130906 Date:10/03/2021

Subject Name:Electrical Circuit Analysis

Time:10:30 AM TO 12:30 PM Total Marks:56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Explain Norton's theorem.	**03**
	(b)	Determine current flowing through R_L for the network shown in Fig. 1 using Nodal voltage technique.	**04**
	(c)	Determine current flowing through 5 Ω resistance for the network shown in Fig. 2 using superposition theorem.	**07**
Q.2	**(a)**	In the circuit shown in Fig.3, the switch 'K' is closed at t=0. Assuming zero initial current through inductor. Find '*i*', '*di/dt*' and 'd^2i/dt^2' at $t = 0^+$.	**03**
	(b)	Obtain step response of series R-L circuit.	**04**
	(c)	Determine the load resistance R_L to be connected at terminal A-B in order to transfer maximum power from the network shown in Fig. 4. Also, determine the value of maximum power.	**07**
Q.3	**(a)**	Determine equivalent inductance between terminals A-B for the coupled circuit shown in Fig. 6.	**03**
	(b)	Explain the steps to obtain dual of a network with suitable example.	**04**
	(c)	Determine power supplied by 20 V source for the network shown in Fig. 7 using loop current method.	**07**
Q.4	**(a)**	Explain dot rule for coupled circuit.	**03**
	(b)	Draw power triangle for series R-L circuit and define related terms.	**04**
	(c)	Determine current flowing through R_L= 5 Ω resistance for the network shown in Fig. 8 using Thevenin's theorem.	**07**
Q.5	**(a)**	Define unit ramp function. Obtain Laplace transform of unit ramp function.	**03**
	(b)	In the network shown in Fig. 9, the switch is closed at t=0. By the method of Laplace transform, determine the current. Assume zero initial condition. Take ω = 10 r/s.	**04**
	(c)	Define poles and zeros of network function. Explain significance of poles and zeros in different network functions.	**07**
Q.6	**(a)**	Obtain driving point impedance for the network shown in Fig. 10.	**03**
	(b)	Draw magnitude and phase plot of a voltage transfer function for the network shown in Fig. 11	**04**

	(c)	For the network shown in Fig. 12, the switch is in position 1 long enough to establish steady state. At t = 0, the switch is moved to position 2. Find the expression for the current in the circuit.	**07**
Q.7	**(a)**	Define H-parameter of a two-port network.	**03**
	(b)	Obtain condition for reciprocity and symmetry of a two port network in terms of Z-parameters.	**04**
	(c)	Obtain y-parameters for the network shown in Fig. 13	**07**
Q.8	**(a)**	A two port network is represented by following equations: $V_1 = 24\ I_1 + 8\ I_2$ $V_2 = 8\ I_1 + 32\ I_2$ Draw the T-network represented by above equations.	**03**
	(b)	Obtain h-parameters for the network shown in Fig. 14	**04**
	(c)	Obtain ABCD parameters in terms of Z-parameters for a two-port network.	**07**

Figures

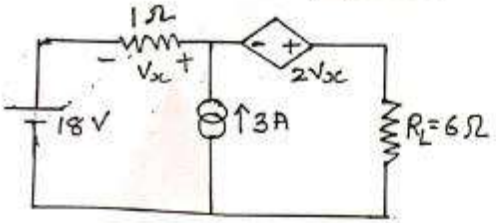

Fig. 1

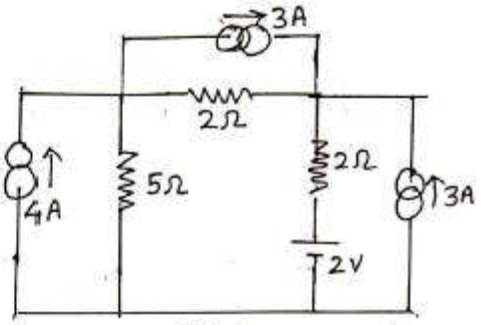

Fig. 2

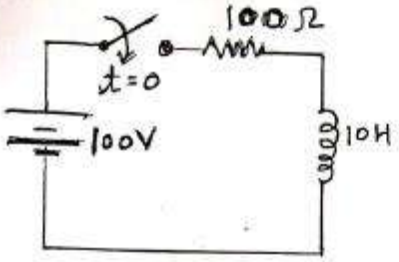

Fig. 3

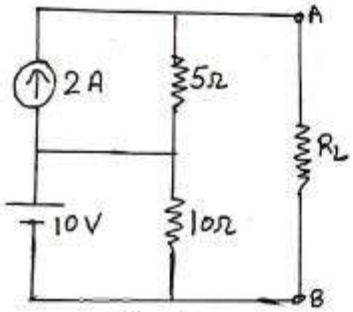

Fig. 4

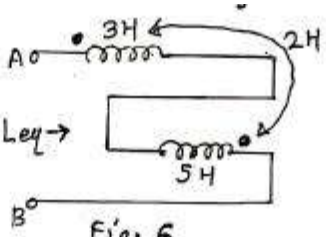

Fig. 6

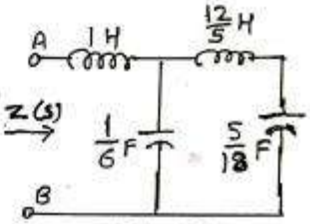

Fig. 10

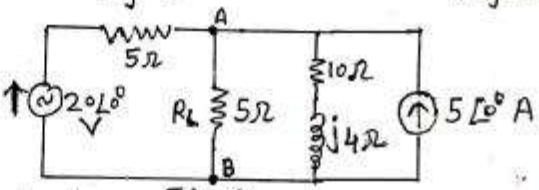

Fig. 8

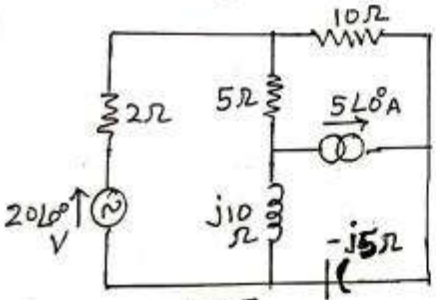

Fig. 7

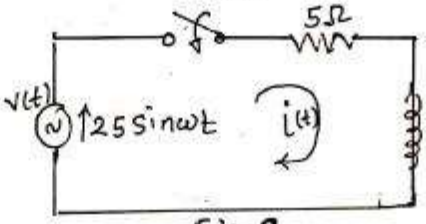

Fig. 9

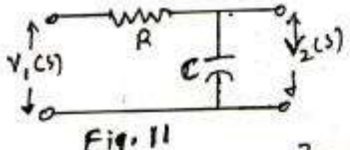

Fig. 11

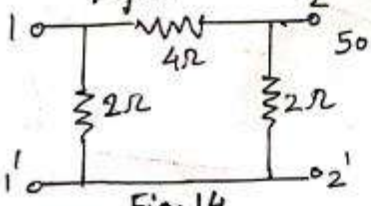

Fig. 14

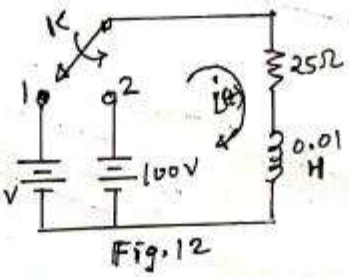

Fig. 12

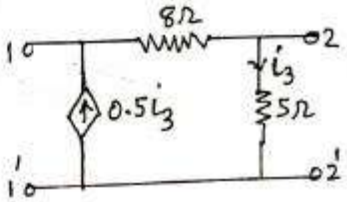

Fig. 13

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2021

Subject Code:3130906 Date:19-02-2022

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 for the solution of electrical network.	**03**
	(b)	State and explain Reciprocity theorem for the solution of electrical circuits.	**04**
	(c)	Determine the current through j5Ω using superposition theorem of network shown in Fig.1	**07**
Q.2	**(a)**	State and explain Thevenin theorem for the solution of complicated networks.	**03**
	(b)	What is the significance of Maximum Power transfer theorem? State and explain with example.	**04**
	(c)	In the network shown in Fig.2, determine the Thevenin equivalent circuit for the load R_L.	**07**
		OR	
	(c)	Find the current through branch "b-e" using Norton theorem for the network as shown in Fig.3.	**07**
Q.3	**(a)**	Why the current in inductor and voltage in capacitor cannot change simultaneously?	**03**
	(b)	Explain and derive the step response to R-L series circuit using Laplace Transformation method	**04**
	(c)	Construct the exact dual of the network of Fig-4	**07**
		OR	
Q.3	**(a)**	Point out the relations between voltage and current for the following passive elements. (1) Resistor (2) Capacitor.	**03**
	(b)	Give details of the procedure to obtain sinusoidal steady state response of a circuit	**04**
	(c)	The circuit shown in Fig.5 consists of a resistor and a relay with inductance (L). The relay is adjusted in such a way that it is actuated when the current through the coil is 8 mA. The switch is closed at t=0 and it is observed that the relay is actuated when t = 0.1 sec. Determine (a) the value of L and (b) the equation of current.	**07**
Q.4	**(a)**	Enlighten significance of poles and zeros in network functions.	**03**
	(b)	As shown in Fig.6, the switch K is opened at time t = 0. Obtain the particular solution for voltage v(t) across the parallel circuit using Laplace transformation.	**04**
	(c)	The switch is open at t = 0 for the circuit shown in Fig.7. Steady state condition has been achieved before switching. Find the expression for the current i(t) using Laplace transformation.	**07**

OR

Q.4	**(a)**	Explain concept of Laplace transformation. What are the advantages and disadvantages of Laplace transformation?	**03**
	(b)	What are the properties of Laplace transformation? Explain in detail.	**04**
	(c)	Obtain current equation i(t) for $t \geq 0$ using Laplace Method for Fig.8.	**07**
Q.5	**(a)**	Derive condition of Symmetry of h-Parameter.	**03**
	(b)	Derive relationship of z-Parameter in terms of ABCD Parameter	**04**
	(c)	Obtain h-Parameters of the network shown in Fig.9	**07**

OR

Q.5	**(a)**	Derive condition of reciprocity of y-Parameters.	**03**
	(b)	Derive relationship of h-Parameter in terms of g-Parameters	**04**
	(c)	Obtain Transmission Parameters of the network shown in Fig.10. Find whether the network is (i) symmetrical (ii) reciprocal	**07**

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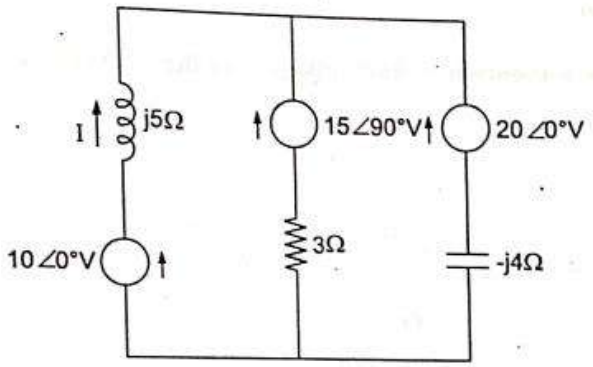

Fig.1

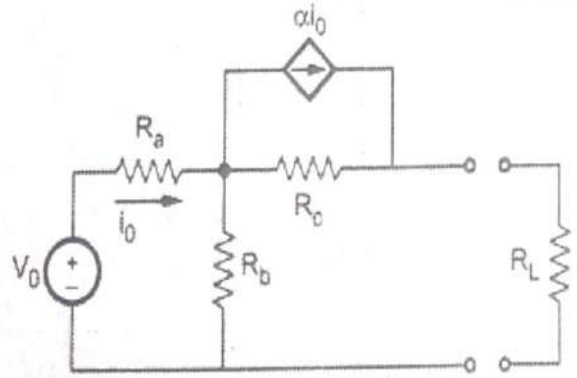

Fig.2

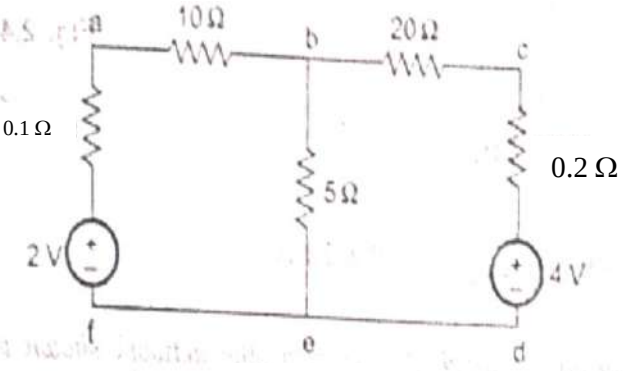

Fig.3

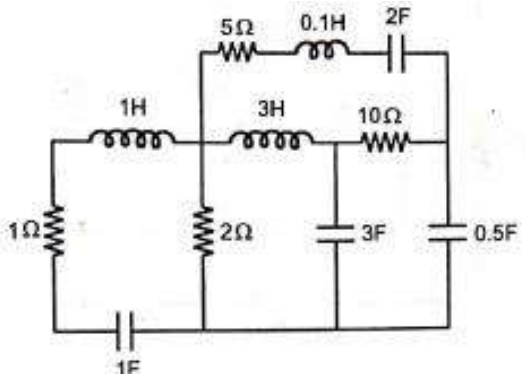

Fig.4

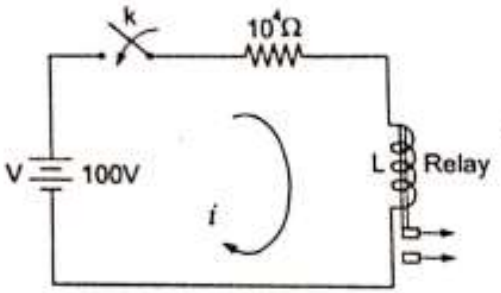

Fig.5

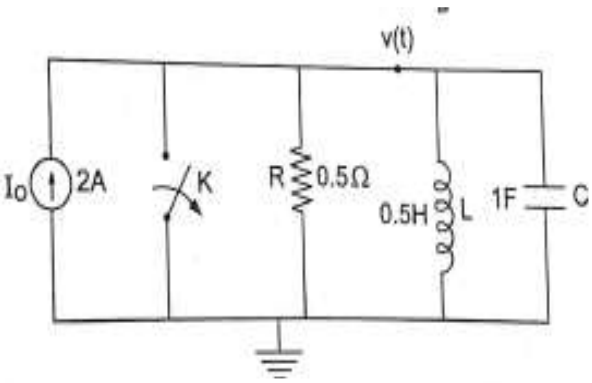

Fig.6

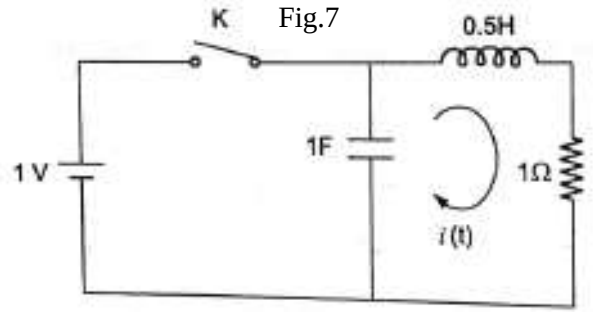

Fig.7

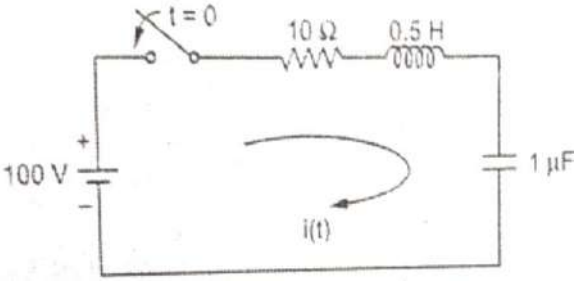

Fig.8

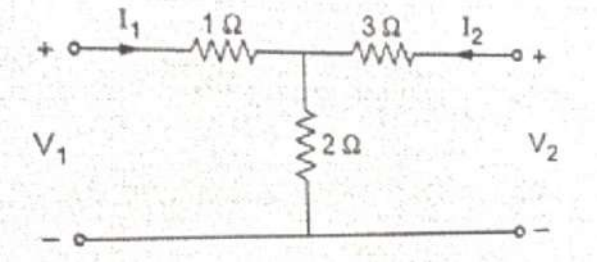

Fig.9

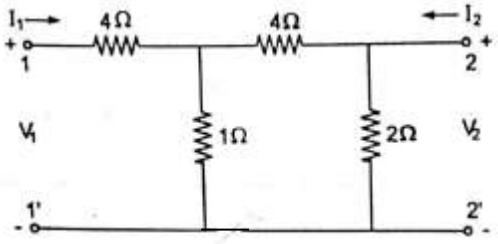

Fig.10

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:3130906 Date:08/09/2021

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)	For the electrical network shown in **Figure 1**, find the value of unknown current I_1, I_2 and I_3 using the mesh analysis technique.	**04**
	(c)	The network shown in **Figure 2** contains the dependent source and an independent source. Find the Norton's equivalent circuit across terminals A and B.	**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)	In the given circuit shown in **Figure 3**, capacitor C has initial voltage $V_c(0^-)=5V$ and at the same time current through inductor L is zero. Obtain the dv(t)/dt at $t=0^+$ if the switch K is closed at the time t=0 sec.	**04**
	(c)	In the circuit shown in **Figure 4**, a d.c. voltage of 10 volts is suddenly applied by closing switch to a series circuit consisting of resistor R=10**Ω**, inductor L=1H and capacitor C=0.04F. Obtain the expression of current *i(t)* for t>0.	**07**
		OR	
	(c)	For the network shown in **Figure 5**, obtain the expression of current $i_1(t)$ and $i_2(t)$ for t>0. Consider switch K is closed at t=0 sec.	**07**
Q.3	**(a)**	Define the term (i) RMS values (ii) Apparent power (iii) Complex power.	**03**
	(b)	For the circuit diagram shown in **Figure 6**, obtain the impedance Z_{eq} and admittance Y_{eq}.	**04**
	(c)	In the network shown in **Figure 7**, determine the voltage V which results in a zero current through the impedance 2+j3**Ω**.	**07**
		OR	
Q.3	**(a)**	Explain in brief about the ideal transformer.	**03**
	(b)	Explain the dot rule for mutually coupled circuit using the suitable example.	**04**
	(c)	For the network shown in **Figure 8**, a three-phase, three-wire, balanced ABC system, with an effective line voltage of 120 V, has three impedances of $5\angle 45^\circ\ \Omega$ in a ▲(delta) connection. Determine the line currents and draw the phasor-diagram showing the voltage, current relationship.	**07**
Q.4	**(a)**	Convert the capacitance C (passive element) to Laplace domain using Laplace transformation.	**03**
	(b)	Obtain Laplace transformation of the following time-domain function: (i) f(t) = A (ii) $f(t) = e^{-at}$	**04**

	(c)	Obtain the step response of the series RC-circuit shown in **Figure 9.**	**07**
		OR	
Q.4	**(a)**	For the network shown in **Figure 10**, find the $Z_{21}(s)$.	**03**
	(b)	Define the term Poles and Zeros with suitable example.	**04**
	(c)	Determine the input impedance of the given network shown in **Figure 11**. Assume all the initial conditions are to be zero.	**07**
Q.5	**(a)**	What is the condition of symmetry of all different two port parameters?	**03**
	(b)	Derive expression of Y parameters in terms of Z parameters.	**04**
	(c)	Obtain the Y parameters of the given network in **Figure 12**.	**07**
		OR	
Q.5	**(a)**	Explain the transmission line parameters for the two-port network.	**03**
	(b)	Obtain Y-parameters for the given network shown in **Figure 13**.	**04**
	(c)	Obtain the Z parameters of the given network in **Figure 14**.	**07**

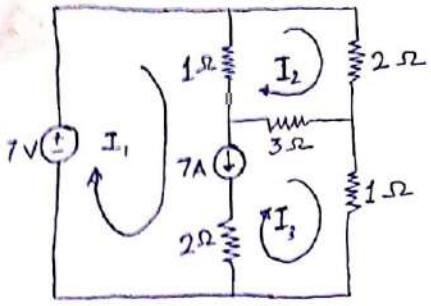

Figure - 1

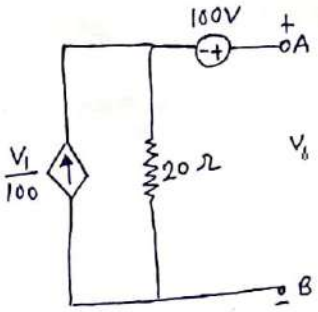

Figure-2

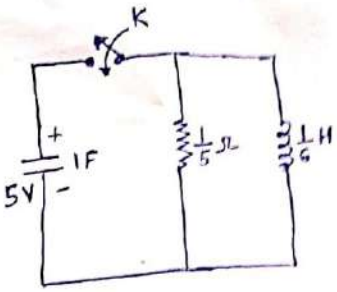

Figure -3

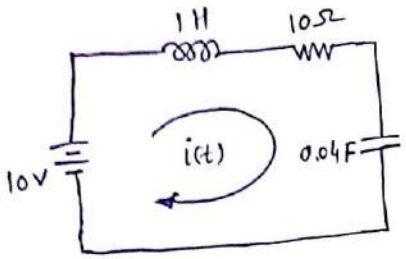

Figure-4

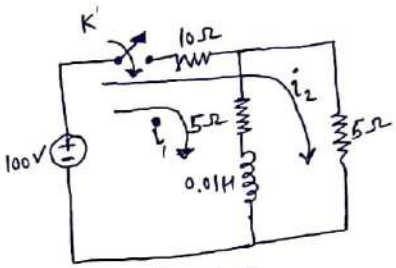

Figure-5

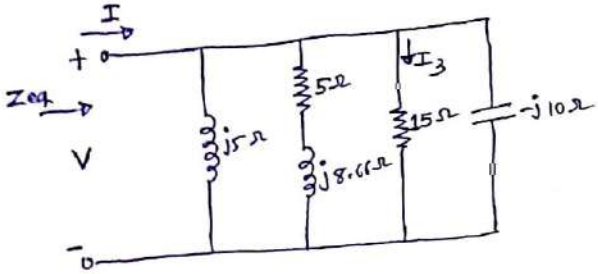

Figure- 6

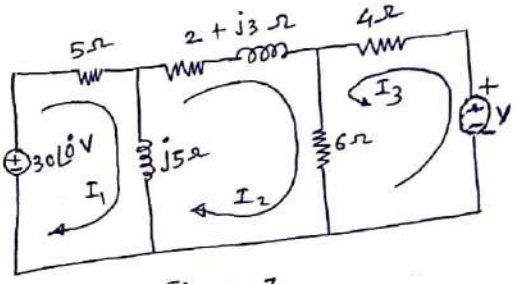

Figure- 7

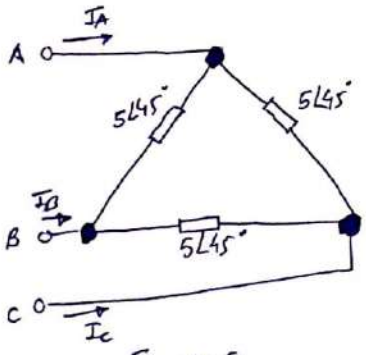

Figure- 8

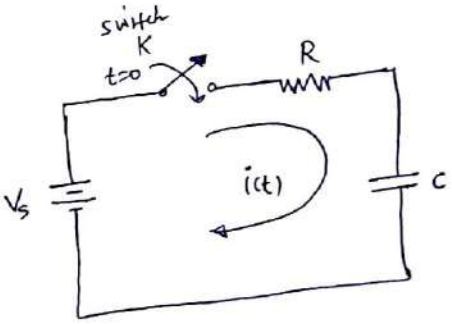

Figure- 9

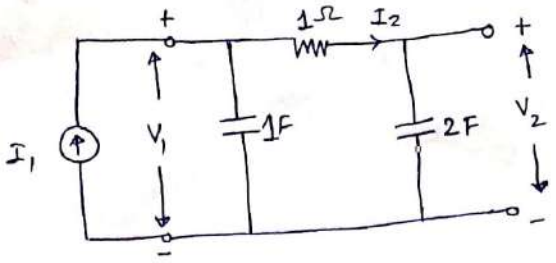

Figure - 10

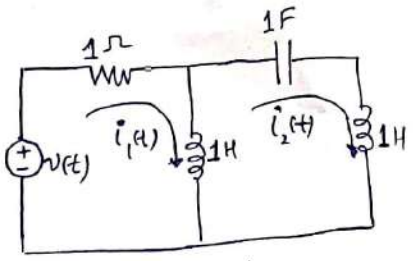

Figure - 11

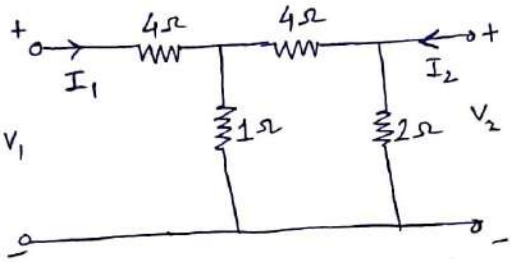

Figure - 12

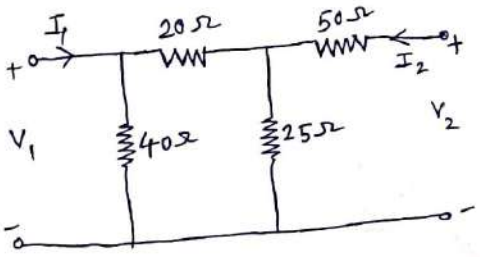

Figure - 13

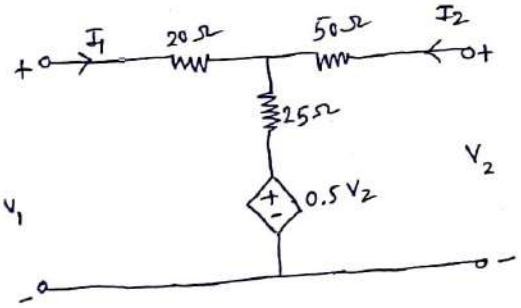

Figure - 14

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3130906 Date:28-07-2022

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 reciprocity and superposition theorem.	**03**
	(b)	Discuss open-circuit impedance parameters and draw equivalent circuit for open circuit impedance parameters.	**04**
	(c)	In the network shown in fig.1, using node analysis, Calculate V_2 which results in zero current through 4 Ω resistor.	**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 Norton's theorem with suitable example.	**07**
		OR	
	(c)	Explain Thevenin's theorem with suitable example.	**07**
Q.3	**(a)**	Elaborate series-series 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. Figure out the values of i_1, i_2, di_1/dt and di_2/dt at t=0+.	**07**
		OR	
Q.3	**(a)**	Explain series-parallel connection for two-port network.	**03**
	(b)	List difference between ideal and practical current 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, the switch k is closed at t=0, a steady state having previously been attained. Compute the particular solution for the current.	**04**
	(c)	In the network of fig.7, the switch is closed for a long time and at t=0, the switch is opened. Evaluate the current through the capacitor using Laplace transformation.	**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 switch k is in position k is in position a for a long period of time. At t=0, the switch is moved from a to b. Calculate V_2 (t). **04**

(c) In a series R-L-C circuit, R=5Ω, L=1H and C=0.25 F and v(t) = $6e^{-2t}$ 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 h-Parameters. **03**

(b) Generalize relationship of ABCD to z-parameters. **04**

(c) For the network shown in fig.10, the capacitor is initially charged to a voltage V_0, with a polarity indicated on the diagram. The switch k is closed at time t=0. Discover the particular solution for the current in the circuit using Laplace transform. **07**

OR

Q.5 **(a)** Find out symmetry condition for ABCD parameters **03**

(b) Generalize relationship of h-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**

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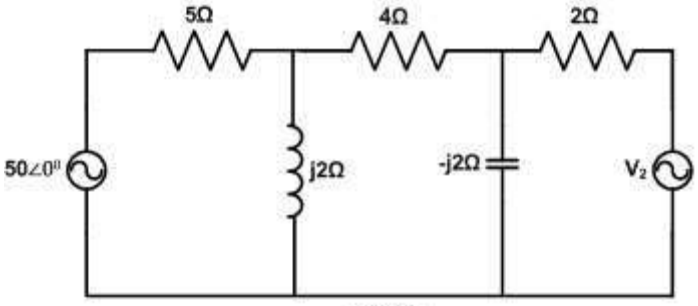

Fig.01

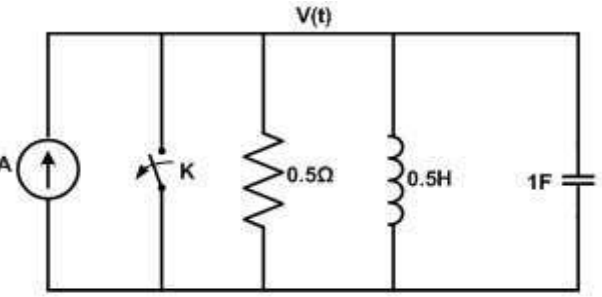

Fig.02

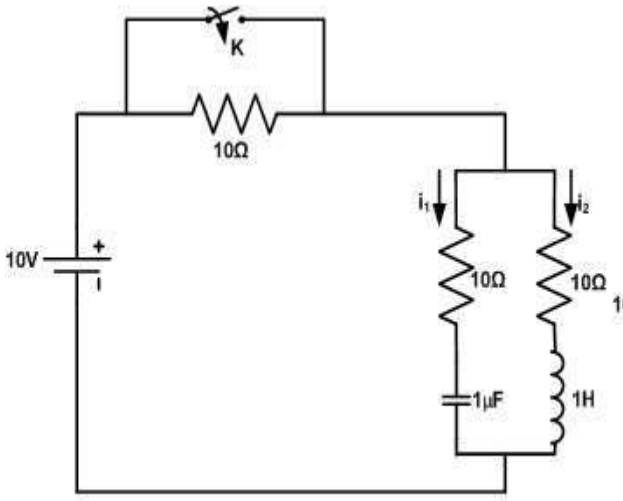

Fig.03

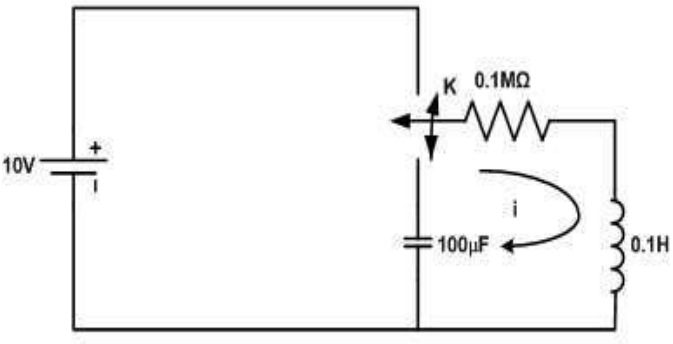

Fig.04

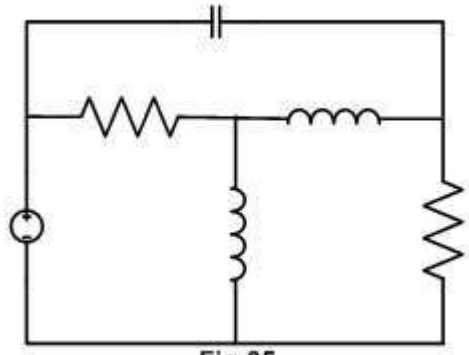

Fig.05

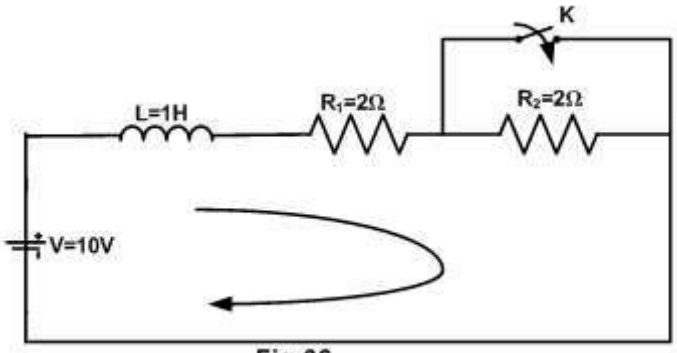

Fig.06

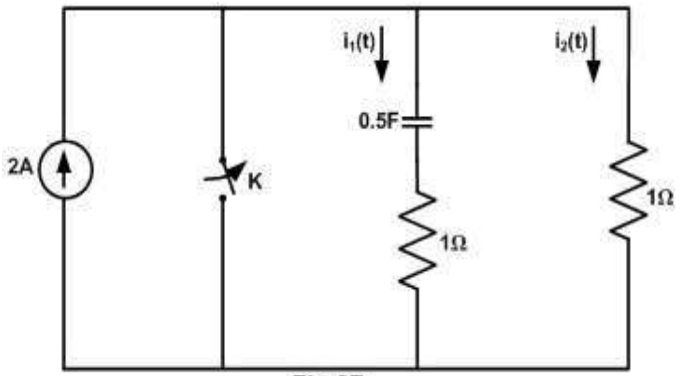

Fig.07

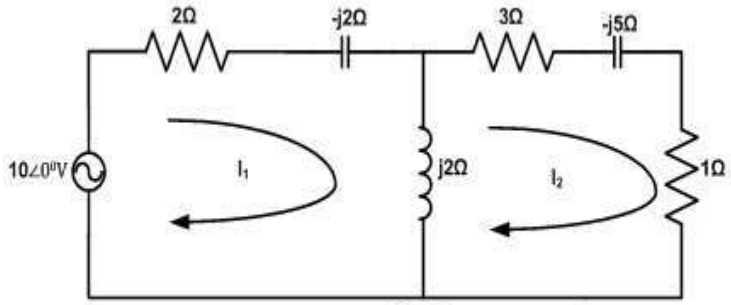

Fig.08

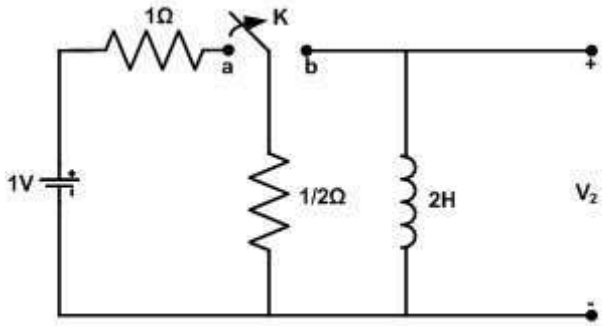

Fig.09

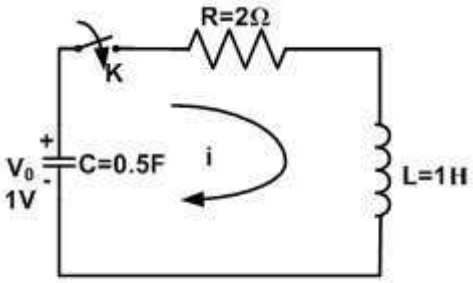

Fig.10

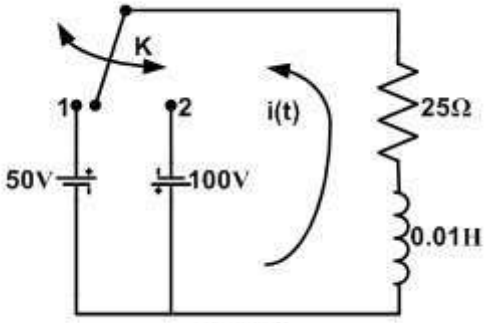

Fig.11