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**

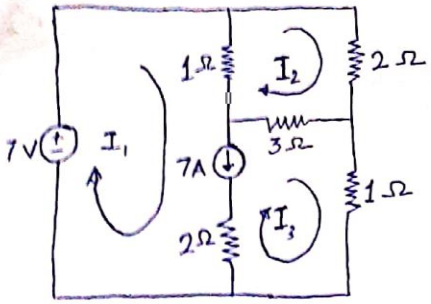

Figure - 1

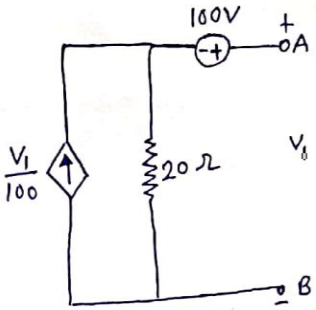

Figure-2

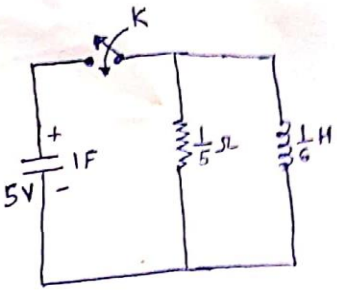

Figure -3

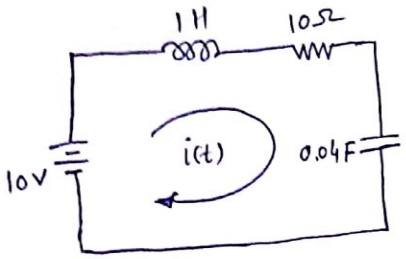

Figure-4

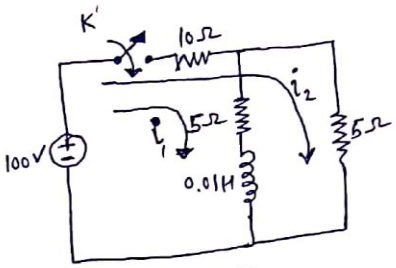

Figure-5

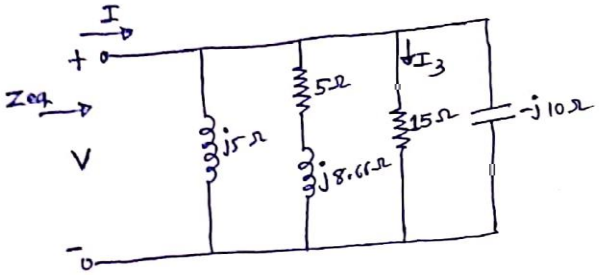

Figure - 6

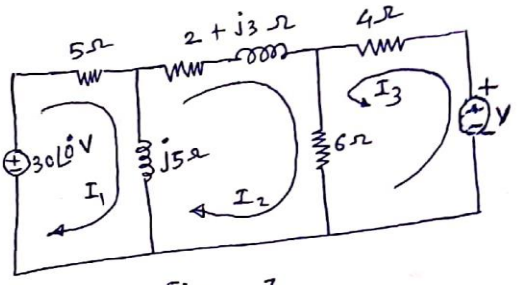

Figure - 7

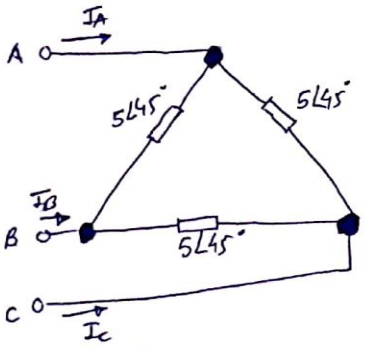

Figure - 8

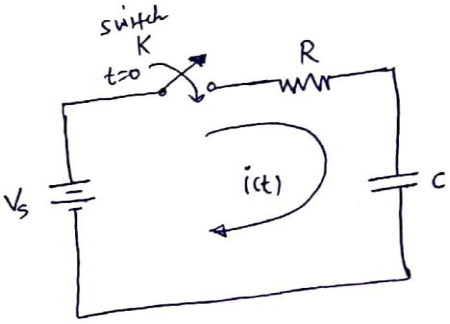

Figure - 9

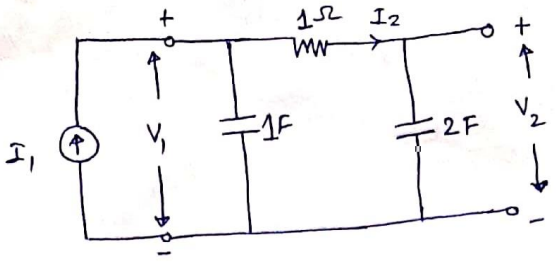

Figure - 10

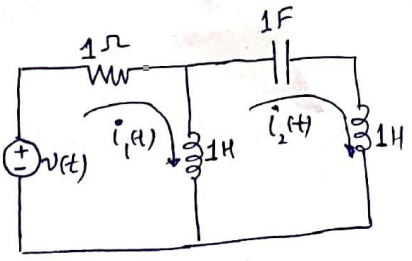

Figure - 11

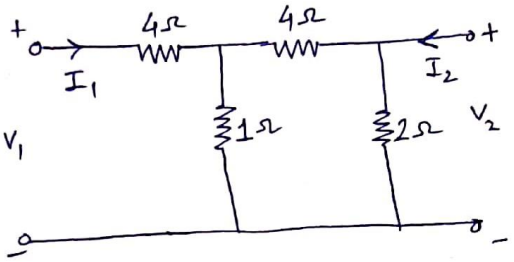

Figure - 12

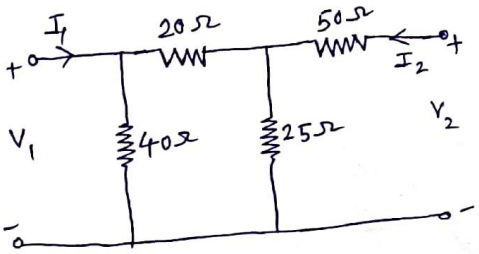

Figure - 13

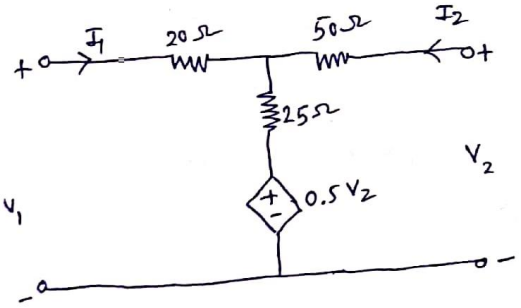

Figure - 14