ECE 56

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 7038

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – AUG. / SEP. 2023

Second Semester

Electronics and Communication Engineering

U19EC201– ELECTRIC CIRCUIT THEORY

(Regulation 2019)

(Common to Biomedical Engineering)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Draw the dual of the network shown in Fig.1	2	K1	CO1

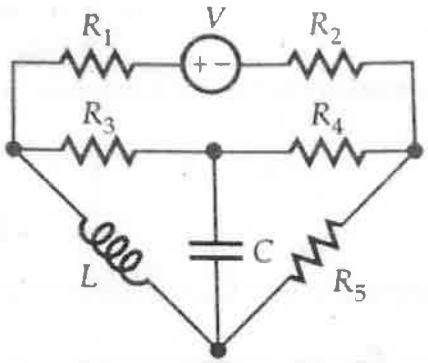

Fig.1

2.	State supernode. Draw the circuit as an example and mention supernode region.	2	K2	CO1
3.	Compare Star and Delta transformation with necessary circuits.	2	K2	CO2

4.	Determine Norton's equivalent circuit at terminals AB for the circuit shown in Fig. 2	2	K2	CO2

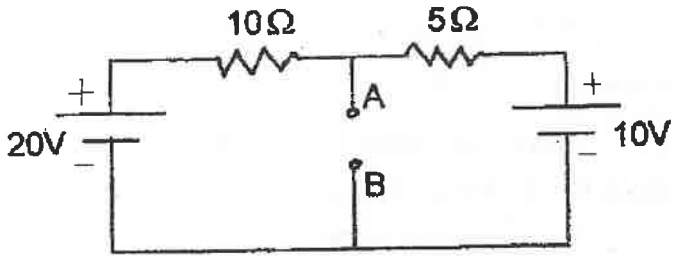

Fig. 2

5.	A resistor having a resistance of 10Ω and an unknown capacitor are in series. The voltage across the resistor is $V_R = 40\sin(1000t + 45^0)$. If the current leads the applied voltage by 45^0, determine the unknown capacitance.	2	K2	CO3
6.	How do we apply dot convention in circuit analysis? Give one example circuit.	2	K2	CO3
7.	Recall the expressions for the time constant of RL and RC circuits.	2	K1	CO4
8.	Define transient time.	2	K1	CO4
9.	Recall the condition of reciprocity for the h- and y- parameters.	2	K1	CO5
10.	The port currents of a two-port network are given by $I_1 = 2.5V_1 - 1.5V_2$ $I_2 = -V_1 + 7V_2$ Obtain the admittance parameters for the above network.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Determine the power dissipated in the 10Ω resistor using KCL for the circuit shown in Fig. 3	13	K2	CO1

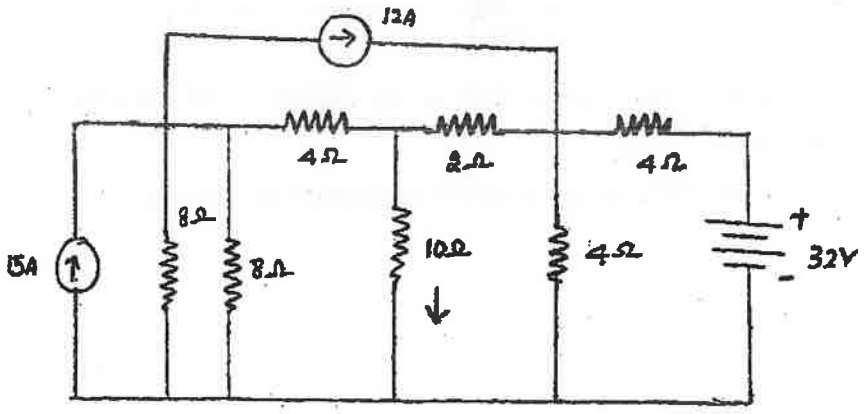

Fig. 3

(OR)

b) i. Apply KVL to find mesh currents, I_{L1}, I_{L2}, and I_{L3} for the network shown in Fig. 4. 8 K2 CO1

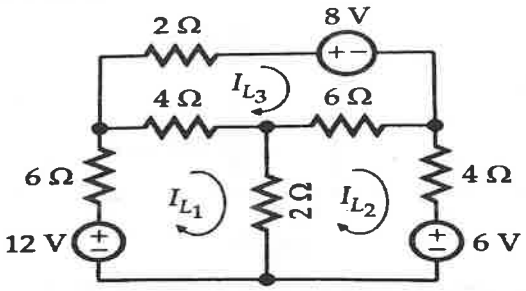

Fig. 4

ii. Explain the concept of f-cut-set matrix with oriented graph, tree and also specify twig matrix, link matrix. 5 K2 CO1

12. a) i. Find the current through j3 Ω for the circuit shown in Fig. 5 using Superposition theorem. 6 K2 CO2

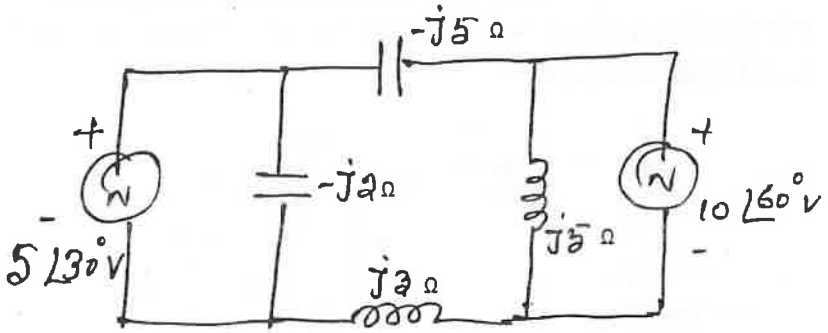

Fig. 5

ii. With necessary equations explain the following

a. Thevenin's theorem. 2

b. Steps to apply Thevenin's theorem and the method to calculate Thevenin's equivalent voltage with necessary circuit. 5

K2 CO2

(OR)

b) Make use of maximum power transfer theorem for the following circuit in Fig. 6 to find the maximum power dissipated across Z_L. 13 K2 CO2

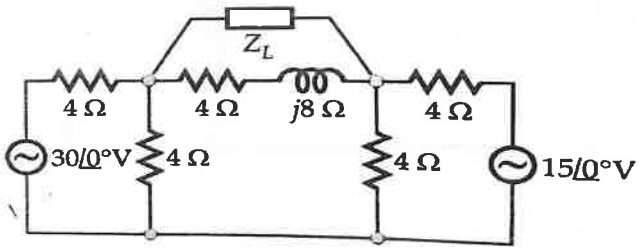

Fig. 6

13. a) i. Find the admittance Y_{AB} for the circuit shown in Fig. 7. The Supply frequency is 50Hz. 7 K2 CO3

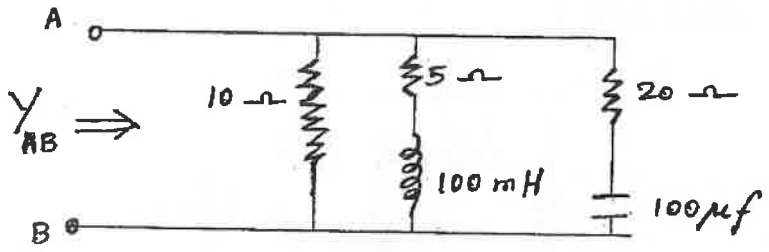

Fig. 7

ii. A current source is applied to the parallel R, L, and C circuit, where R = 12 Ω, L = 2 H and C = 3 μF. Compute the resonant frequency, quality factor, and bandwidth. Compute the lower and upper cut-off frequencies and the voltage across the parallel elements, when the input signal is i(t) = 10sin1800t. 6 K2 CO3

(OR)

b) i. For the circuit shown in Fig. 8, find the ratio of output voltage V_2 to the input voltage V_1. 6 K2 CO3

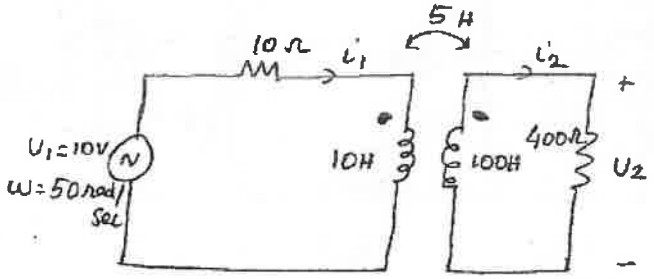

Fig. 8

ii. Find the voltage drop across the capacitor and resistor, as shown in Fig. 9 7 K2 CO3

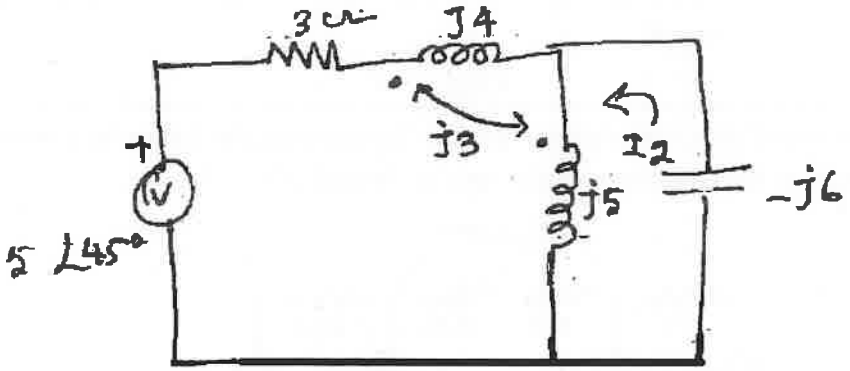

Fig. 9

14. a) In the circuit shown in Figure 10, switch K is closed at position A at t = 0. After the lapse of time equivalent to one time constant, the switch is moved to position B. Determine the complete current. 13 K2 CO4

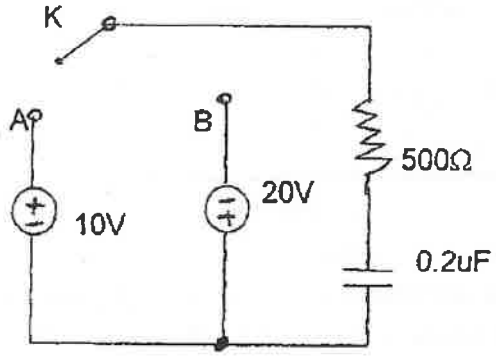

Fig. 10

(OR)

b) Discuss in detail about the transient response of RL, RC and RLC circuits using Laplace transform with necessary equations. 13 K2 CO4

15. a) The Z parameters of a two-port network are $Z_{11}=10\Omega$, $Z_{22}=15\Omega$, $Z_{12}=Z_{21}=5\Omega$. Interpret h-parameters and ABCD parameters for the network. 13 K2 CO5

(OR)

b) The two networks shown in Fig. 11 are connected in series. Obtain Z parameters of the combined network. 13 K2 CO5

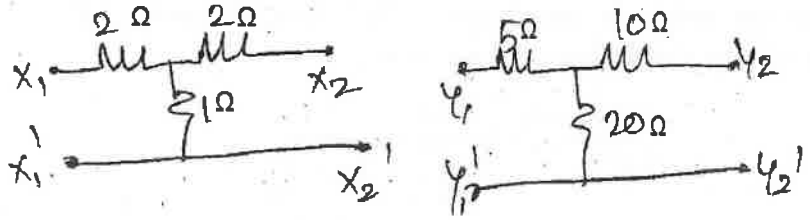

Fig. 11

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16. a)	i.	Determine the current through AB in the network shown in Fig. 12, using Norton's theorem.	7	K2	CO2

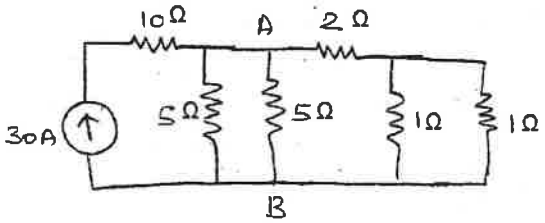

Fig. 12

ii. Obtain Thevenin's equivalent circuit across the terminals A-B for the circuit shown in Fig. 13 — 8 — K2 — CO2

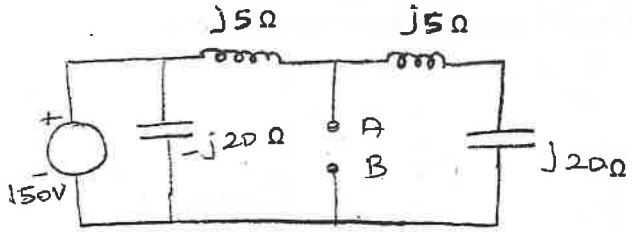

Fig. 13

(OR)

b) i. Draw a graph, and determine the number of branches, number of nodes and number of links. Also, Write down the incidence matrix, tieset matrix and cut set matrix for the network, has been shown in Fig. 14. — 7 — K2 — CO1

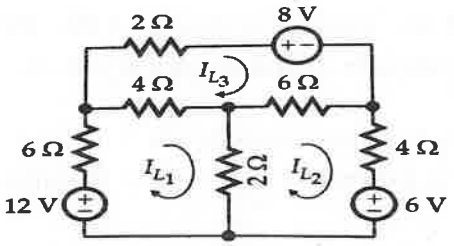

Fig.14

ii. In the circuit shown in Fig. 15, Determine the value of R_L such that the power is transferred to R_L. Also, determine the maximum power dissipated across R_L. — 8 — K2 — CO2

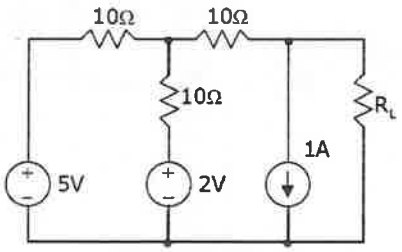

Fig.15