Reg. No.															

Question Paper Code	13732

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Second Semester

Electronics and Communication Engineering

20ECPC201 – CIRCUIT ANALYSIS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	A wire is stretched to double its original length. What happens to its resistance, assuming volume remains constant? (a) remains same (b) doubles (c) becomes 4 times (d) becomes half	1	K2	CO1
2.	If you mistakenly connect a voltmeter in series in a circuit using Kirchhoff's laws, what is the most likely effect? (a) Circuit works as usual (b) Current becomes zero (c) Current increases (d) Resistance of circuit decreases	1	K2	CO1
3.	Find the no of mesh equations are needed for a circuit with n independent meshes. (a) n (b) n + 1 (c) n - 1 (d) depends on the number of nodes	1	K1	CO2
4.	A supernode is formed when (a) Two resistors are in parallel (b)Two nodes are connected by a voltage source (c) Two resistors are in series (d)Two nodes are connected by a current source	1	K1	CO2
5.	Superposition theorem requires as many circuits to be solved as there are (a) nodes (b) sources (c) loops (d) none of the above	1	K1	CO3
6.	Which theorem facilitates the calculation of the maximum power transfer from a source to a load in a network? (a) Superposition theorem (b) Maximum Power Transfer theorem (c) Norton's theorem (d) Compensation theorem	1	K1	CO3
7.	In a series RLC circuit, resonance occurs when (a) $X_L < X_C$ (b) $X_L = X_C$ (c) $X_L > X_C$ (d) $X_L = R$	1	K1	CO4
8.	The dot convention in coupled circuits is used to determine (a) Direction of current (b) Polarity of induced voltage (c) Phase shift (d) Frequency response	1	K1	CO4
9.	The time constant for an RC circuit is given by (a) R/C (b) C/R (c) 1/RC (d) RC	1	K1	CO5
10.	If a two-port network is reciprocal, which condition must be satisfied? (a) $Z_{11} = Z_{22}$ (b) $Y_{11} = Y_{22}$ (c) $Z_{12} = Z_{21}$ (d) $H_{12} = H_{21}$	1	K2	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Apply KVL to the loop in a circuit containing a 10V battery and two resistors (2 Ω and 3 Ω) in series carrying current I. Write the loop equation.	2	K2	CO1
12.	Illustrate the incidence matrix.	2	K2	CO1
13.	Calculate the mesh currents in a network containing a 10 V voltage source and two resistors (5 Ω and 10 Ω) in a single loop.	2	K2	CO2
14.	Define open circuit and short circuit.	2	K1	CO2
15.	Mention some of the applications of network theorems.	2	K1	CO3
16.	State Thevenin's theorem.	2	K1	CO3
17.	Compare series and parallel resonance circuits in terms of impedance, current, voltage.	2	K2	CO4

18.	A circuit has two coils with mutual inductance. If the flux produced by one coil does not entirely link the second coil, what factor quantifies this partial coupling?	2	K2	CO4
19.	An RC series circuit is supplied with a DC supply using a switch. The switch is closed at t = 0. How does the capacitor act at t = 0 and t = ∞.	2	K2	CO5
20.	A series RLC circuit with R = 1000Ω, L = 0.1H and C = 100μF has a DC voltage of 200V applied to it at t = 0. For what value of capacitance, the circuit will be critically damped.	2	K2	CO5
21.	List the h-parameters used in communication circuits involving amplifiers.	2	K1	CO6
22.	Compare Z-parameters and Y-parameters with respect to their application in communication systems.	2	K2	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Determine the equivalent resistance for the circuit shown in Fig.23(a)	11	K3	CO1

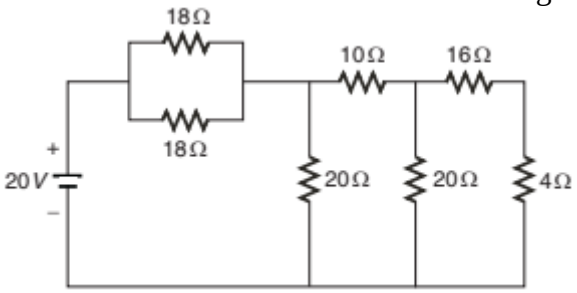

Fig. 23 (a)

OR

	b)	For the network shown in Fig. 23 (b), draw the network graph and tree. Write the cut set and tie set matrix.	11	K3	CO1

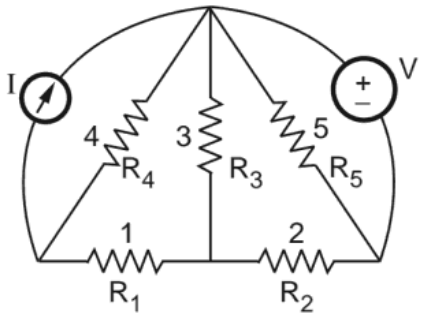

Fig. 23 (b)

24.	a)	Find the branch currents I_1, I_2 and I_3in the circuit shown in Fig. 24 (a) using mesh analysis. Comment on the values of those branch currents if the direction of mesh current i_2 is reversed.	11	K3	CO2

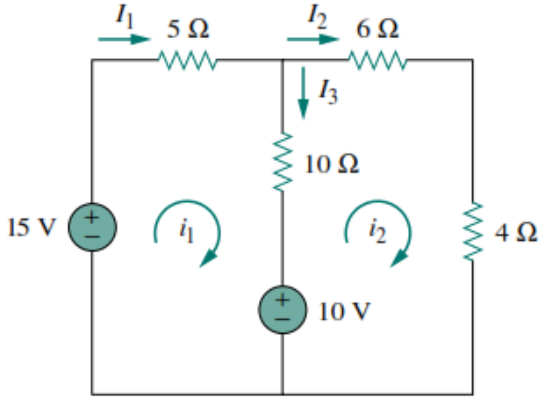

Fig. 24(a)

OR

b) Use nodal analysis to determine the node voltages in the circuit shown in Fig. 24 (b). 11 K3 CO2

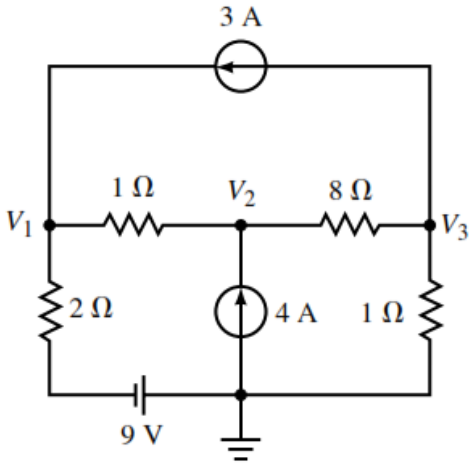

Fig. 24 (b)

25. a) Using the superposition theorem, determine the voltage V_L and the power consumed by the 6 Ω resistor in the circuit shown in Fig. 11 K3 CO3

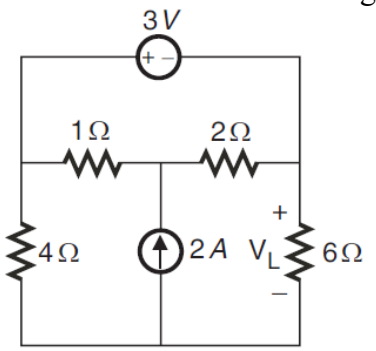

Fig. 25 (a)

OR

b) Verify maximum power transfer theorem using the circuit given in Fig. 25 (b). Find the value of R_L to achieve maximum power transfer and hence calculate the maximum power transferred to the load. 11 K3 CO3

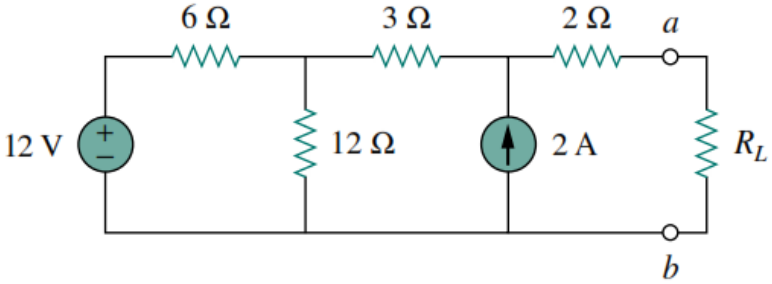

Fig. 25 (b)

26. a) i) A coil of resistance 100 Ω and inductance 100 μH is connected in series with a 100 pF capacitor. The circuit is connected to a 10 V variable frequency source. Calculate the i) current at resonance, ii) frequency at resonance, iii) voltage across L and C at resonance. 6 K2 CO4

ii) Find the value of L at which the circuit resonates at a frequency of 1000 rad/sec in the circuit shown in Fig. 26 (a) (ii). 5 K2 CO4

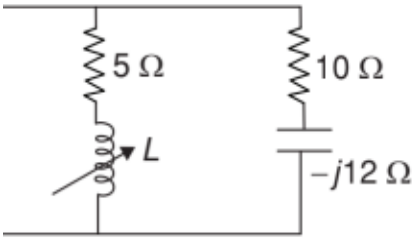

Fig. 26 (a) (ii)

OR

b) Derive the resonant frequency, quality factor, half power frequencies and bandwidth for series RLC circuit. 11 K2 CO4

27. a) In the series RL circuit shown in Fig. 13 a), the switch is closed to position 1 for long time. At t = 0, the switch is closed to position 2. Determine the transient current i(t) 3 milli secs after the switch is closed to position 2. 11 K3 CO5

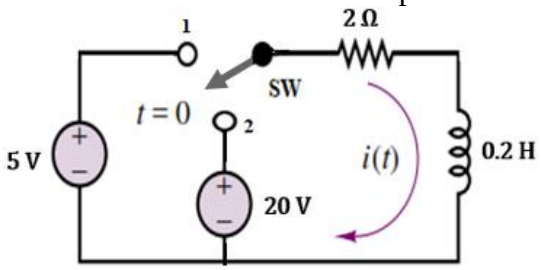

Fig. 27 (a)

OR

b) A series RLC circuit with R = 1000 Ω, L = 0.1H and C = 100 μF has a DC voltage of 200 V applied to it at t = 0 through a switch. Assume initially relaxed circuit conditions. Find the expression for the transient current. 11 K3 CO5

28. a) Determine the Z-parameters of the T-network shown in Fig. Also express the parameters of T-network in terms of Z-parameters. 11 K2 CO6

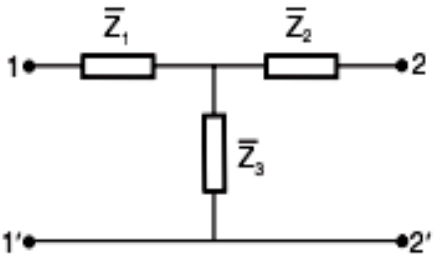

Fig. 28 (a)

OR

b) Determine the hybrid parameters of the circuit shown in Fig. 28 (b). 11 K2 CO6

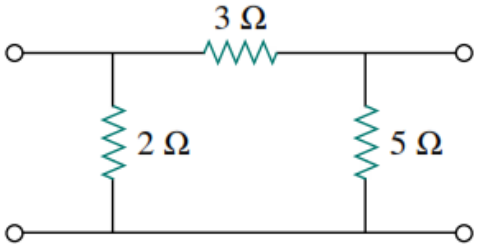

Fig. 28 (b)