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Question Paper Code	14123
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025**

Second Semester

**Electronics and Communication Engineering**

**24ECPC201 - CIRCUIT ANALYSIS**

Regulations - 2024

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (10 × 1 = 10 Marks)**

Answer ALL Questions

	Marks	K- Level	CO
1. The algebraic sum of currents at a node is always: (a) Equal to zero                      (b) Positive                      (c) Negative                      (d) Infinity	1	K1	CO1
2. In an AC circuit, Ohm's law can be expressed as: (a) $V=IR$ (b) $V=IZ$ (c) $V=I/X$ (d) $V=I/L$	1	K1	CO1
3. The number of twigs in a tree of a network is equal to: (a) Number of loops                      (b) Number of nodes – 1 (c) Number of branches – 1                      (d) Number of cut sets	1	K1	CO2
4. The term "duality" in network theory means: (a) Same network repeated twice                      (b) Interchanging voltage and current relationships (c) Combining two networks                      (d) Removing dependent sources	1	K1	CO2
5. The Superposition theorem is applicable only to: (a) Non-linear circuits                      (b) Linear circuits                      (c) Passive circuits                      (d) Active circuits	1	K1	CO3
6. The condition for maximum power transfer in DC circuits is: (a) $R_L=R_S$ (b) $R_L>R_S$ (c) $R_L<R_S$ (d) $R_L=0$	1	K1	CO3
7. At resonance in a series RLC circuit, the impedance is: (a) Minimum                      (b) Maximum                      (c) Infinite                      (d) Zero	1	K1	CO4
8. Mutual inductance exists when: (a) Two coils are connected in series                      (b) The magnetic flux of one coil links another (c) The coils are isolated                      (d) Current is zero in both coils	1	K1	CO4
9. The natural response of a circuit depends on: (a) External source only                      (b) Initial energy stored in element (c) Frequency of excitation                      (d) Type of excitation signal	1	K1	CO5
10. The ABCD parameters are called: (a) Impedance parameters                      (b) Hybrid parameters (c) Transmission parameters                      (d) Inverse parameters	1	K1	CO6

**PART - B (12 × 2 = 24 Marks)**

Answer ALL Questions

11. State ohm's law.	2	K1	CO1
12. State Kirchoff's Voltage law.	2	K1	CO1
13. Compare incidence matrix and reduced incidence matrix.	2	K2	CO2
14. Illustrate voltage division rule with suitable example.	2	K2	CO2
15. Recall the steps involved in finding Thevenin's equivalent circuit.	2	K1	CO3
16. Relate Thevenin voltage ( $V_{Th}$ ) and Norton current ( $I_N$ ).	2	K2	CO3
17. Define Q-factor. How is it related to bandwidth?	2	K1	CO4
18. Define coefficient of coupling (k) and write its range.	2	K1	CO4
19. What is the condition for resonance in a series RLC circuit?	2	K2	CO5
20. Show the time constant for (i) RC and (ii) RL circuits.	2	K2	CO5
21. Recall the Z-parameter equations for a two-port network.	2	K1	CO6

22. State the condition for symmetry in ABCD parameters.

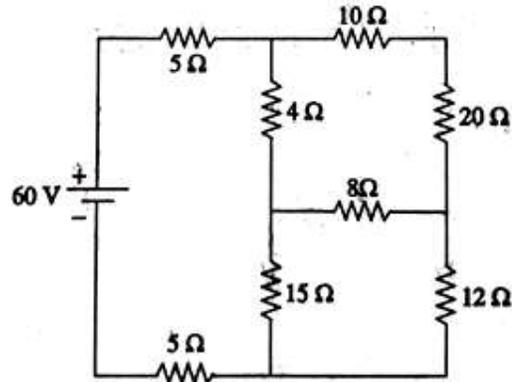
2 K1 CO6

**PART - C (6 × 11 = 66 Marks)**

Answer ALL Questions

23. a) Apply mesh analysis; compute the current delivered by the battery.

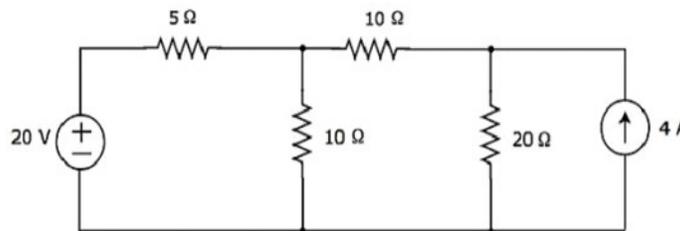
11 K3 CO1



OR

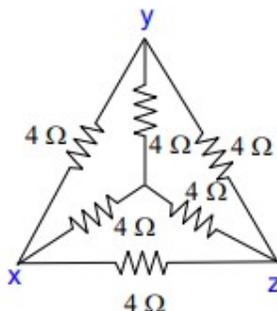
b) Identify the current flowing through 20 Ω resistor of the following circuit using Nodal analysis.

11 K3 CO1



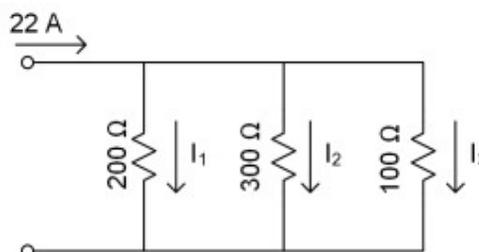
24. a) (i) Simplify the given circuit to its equivalent star network.

6 K4 CO2



(ii) Simplify the network and using the current-division rule, determine the current  $I_1$ . Verify your result by examining the current distribution in both branches.

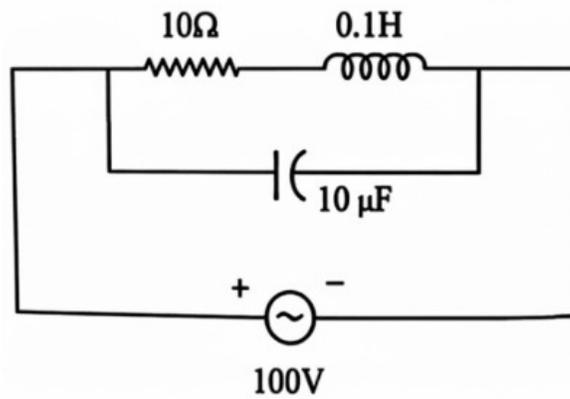
5 K4 CO2



OR

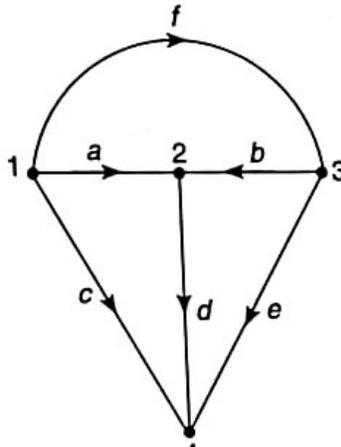
b) (i) Analyze and draw the dual of the given network.

6 K4 CO2



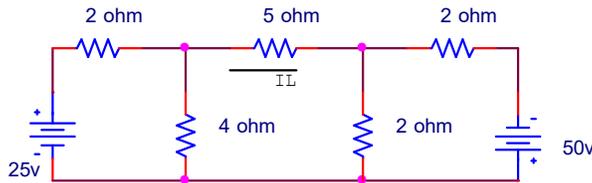
(ii) Analyze the nodes of the given graph and obtain the incidence matrix.

5 K4 CO2



25. a) Evaluate the current in 5 ohm resistance in the circuit shown in fig. using superposition theorem.

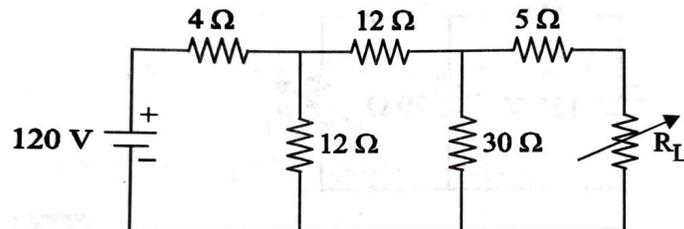
11 K4 CO3



OR

b) Analyze the network and determine the value of  $R_L$  that will receive maximum power. Calculate the maximum power delivered to  $R_L$ .

11 K4 CO3



26. a) A series RLC circuit with  $R=10\Omega$  and  $L=10\text{mH}$  and  $C=1\mu\text{F}$  has an applied voltage of 200V at resonant frequency. Calculate the resonant frequency, Analyze the current in the circuit and voltages across the elements at resonance. Find also the quality factor and bandwidth.

11 K4 CO4

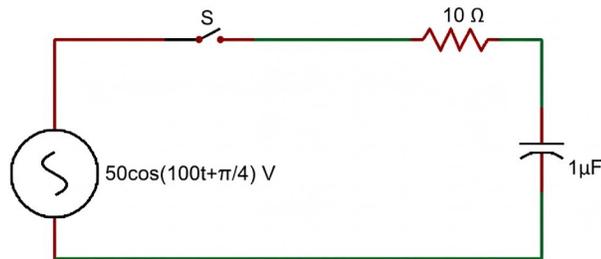
**OR**

- b) (i) Two coupled coils with self-inductance 0.9H and 0.4H have a coupling coefficient of 0.3. Find the mutual inductance and turns ratio. What will be the maximum possible value of mutual inductance? 6 K4 CO4
- (ii) Two coils offer an equivalent inductance of 0.8H when connected in series aiding and 0.4 H in series opposing. Calculate the self-inductance of the coils. Assume the coefficient of coupling be 0.55. 5 K4 CO4

27. a) Analyze the transient response for RLC series circuit for a step input. 11 K4 CO5

**OR**

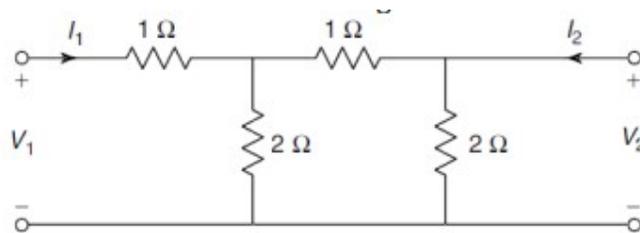
- b) Determine the complete response for the current when the switch S is closed at  $t=0$ . Applied voltage is  $v(t) = 50 \cos\left(100t + \frac{\pi}{4}\right)$  volts, resistance is  $10 \Omega$  and capacitance is  $1 \mu\text{F}$ . 11 K4 CO5



28. a) Define transmission parameters and write its significance. Also, find the transmission parameter of resultant if two networks with transmission parameter  $T_A$  and  $T_B$  are connected in series. 11 K3 CO6

**OR**

- b) Identify the Z parameters of the given circuit. 11 K3 CO6



Also, Compute Y parameters from the obtained Z-parameters.