Reg. No.															

Question Paper Code	13715

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

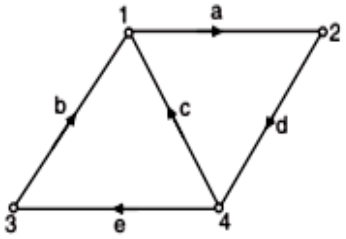
Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	Which of the following is true about a graph representation of an electrical network? (a) Nodes represent components and branches represent connection points (b) Branches represent elements and nodes represent junctions (c) Loops represent power sources (d) Edges represent resistances only	*1*	*K1*	*CO1*
2.	In network duality, which of the following is the dual of a series resistor network? (a) Series capacitor network (b) Parallel inductor network (c) Parallel resistor network (d) Series inductor network	*1*	*K1*	*CO1*
3.	According to Ohm's Law, the current flowing through a resistor is (a) Inversely proportional to voltage (b) Directly proportional to resistance (c) Directly proportional to voltage and inversely proportional to resistance (d) Independent of voltage	*1*	*K1*	*CO2*
4.	Which of the following is true about the mesh current method? (a) It applies KCL to each node (b) It is used only for circuits with voltage sources (c) It uses KVL around closed loops to solve for currents (d) It ignores resistances in the mesh	*1*	*K1*	*CO2*
5.	Thevenin's theorem is used to simplify a complex network to: (a) One current source in parallel with a resistance (b) One voltage source in series with a resistance (c) One voltage source in parallel with a capacitance (d) A purely inductive network	*1*	*K1*	*CO3*
6.	Which of the following statements best describes the Superposition Theorem? (a) It applies only to nonlinear circuits (b) It considers all sources acting simultaneously (c) It allows calculation of circuit response by considering one independent source at a time (d) It is valid only for capacitive circuits.	*1*	*K1*	*CO3*
7.	In a series RLC circuit at resonance, the impedance is (a) Minimum (b) Maximum (c) Zero (d) Infinite	*1*	*K1*	*CO4*
8.	When two coils are magnetically coupled, the induced emf in one coil due to the changing current in another is called (a) Self-inductance (b) Mutual inductance (c) Dot convention (d) Capacitive reactance	*1*	*K1*	*CO4*
9.	RC is the time constant of resistance–capacitance circuit and unit is _____ (a) ohm.farad (b) sec (c) unit less (d) expressed in percentage	*1*	*K1*	*CO5*
10.	Y-parameters are best suited for (a) Open-circuit conditions (b) Short-circuit conditions (c) Power transfer analysis (d) Resonance circuits	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Illustrate link current and tie set matrix.	2	K2	CO1
12.	Find the incidence matrix of the following directed graph.	2	K2	CO1



13.	Define Ohm's law and its limitations.	2	K1	CO2
14.	State Kirchhoff's law.	2	K1	CO2
15.	Why is Superposition theorem not applicable to directly calculate the power in linear circuits?	2	K2	CO3
16.	State the maximum power transfer theorem.	2	K1	CO3
17.	Define Q Factor of a circuit. Also, give its significance.	2	K1	CO4
18.	Write the equations for resonant frequency of series RLC and parallel RLC circuits.	2	K1	CO4
19.	An RL series circuit with R = 10 Ω is excited by a dc voltage source of 30V by closing the switch at t = 0. Determine the current in the circuit at t = 2τ.	2	K2	CO5
20.	In an electric circuit, the voltage across a capacitor does not change abruptly. Is this true? Justify your answer.	2	K2	CO5
21.	Write the Open-Circuit impedance parameters of a Two-Port network.	2	K1	CO6
22.	Brief the term "Reciprocal Network".	2	K2	CO6

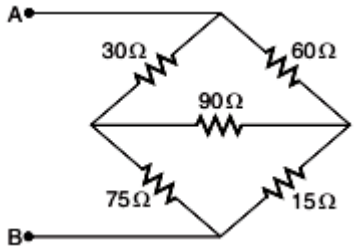
PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

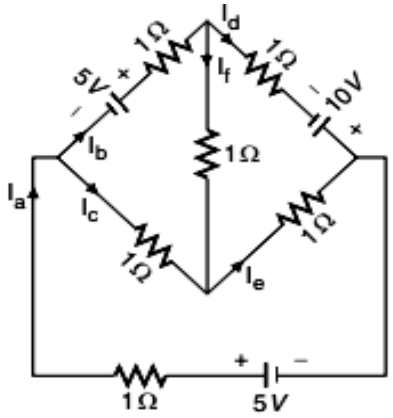
23.	a)	Describe the concept of duality and dual pairs. Also state the procedure followed to interchange between dual pairs.	11	K2	CO1

OR

	b)	Find the equivalent resistance of the network shown in Fig.	11	K2	CO1

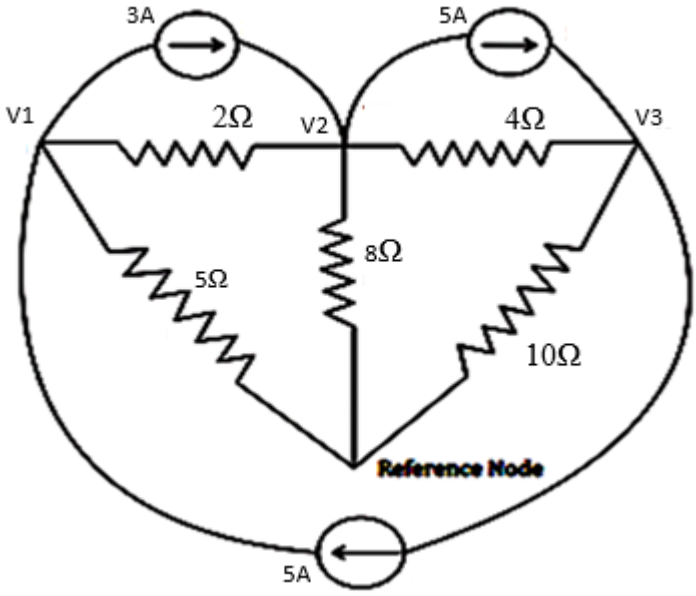


24.	a)	Determine the currents in various elements of the bridge circuit shown in Fig. using mesh analysis.	11	K3	CO2

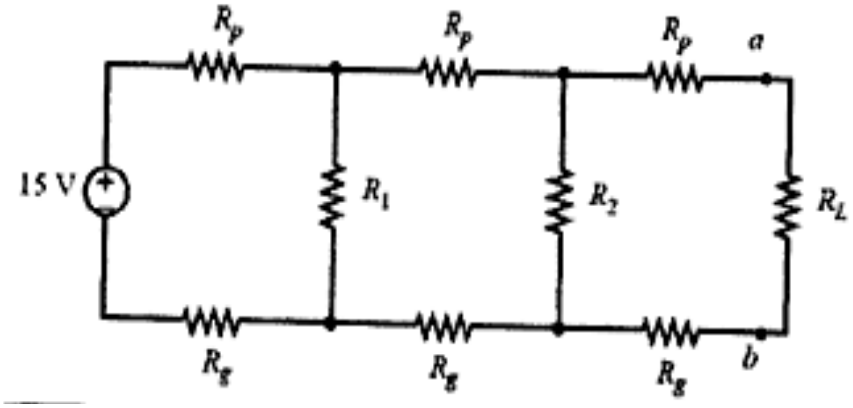


OR

b) Calculate the value of Nodal voltages V_1, V_2 and V_3 by Nodal analysis method as shown in Fig. *11 K3 CO2*

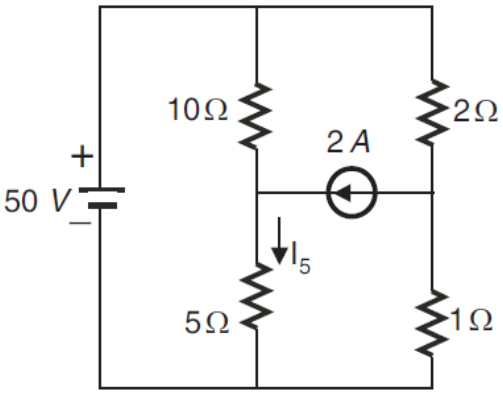


25. a) Using Thevenin's theorem, find the current flowing through the load resistor R_L in circuit shown below, when $R_1 = 10\Omega$, $R_2 = 20\Omega$, Rg = 0.1Ω, Rp = 1Ω, and $R_L = 5\Omega$. *11 K3 CO3*



OR

b) Using the superposition theorem, determine the current through the 5Ω resistor in the circuit shown in Fig. *11 K3 CO3*



26. a) Derive the expression for resonant frequency, bandwidth and Q factor in RLC series circuits. *11 K2 CO4*

OR

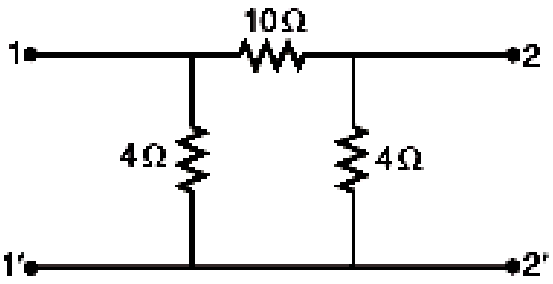
b) Discuss in detail about Single-tuned and Double-tuned coupled circuits. *11 K2 CO4*

27. a) Elucidate the complete response of series RLC circuit with step input signal for under damped system. *11 K2 CO5*

OR

b) An RL series circuit excited by a sinusoidal source e(t) = 10 sin100t V by closing the switch at t = 0. Take R = 10Ω and L = 0.1H. Determine the current i(t) flowing through the RL circuit. *11 K2 CO5*

28. a) Obtain the ABCD Parameters of the following two-port network *11 K3 CO6*



OR

b) Determine the Z-parameters of the T-network shown in Fig. Also express the parameters of T-network in terms of Z-parameters. *11 K3 CO6*