Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN | | | | | | | | | | |

Course Code	2	2	E	E	3	6	1

Third Semester B.E. Degree Examinations, March/April 2024

ELECTRIC CIRCUIT ANALYSIS

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any*** **FIVE** ***full questions choosing ONE full Question from each Module.***
2. Missing data, if any, may be suitably assumed

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		Module-1		
1.	**a.**	Explain (i) Passive and Active networks (ii) Ideal and practical voltage sources (iii) Ideal and practical current sources (iv) Dependent and Independent sources.	**08**	(2 :1 : 1.3.1)
	b.	Explain (i) Voltage source shifting (ii) Current source shifting.	**06**	(2 :1 : 1.3.1)
	c.	Determine voltage V for the circuit shown in Fig.Q1(c) using source shift and source transformation methods.	**06**	(3 :1 : 1.3.1)

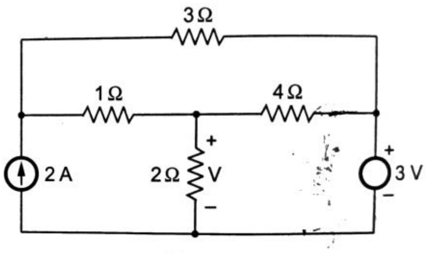

Fig.Q1(c).

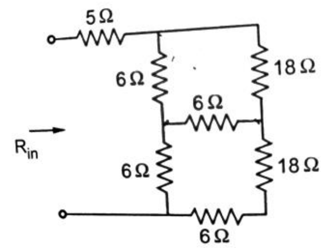

Fig. Q2 (a).

(OR)

2.	**a.**	Obtain R_{in} using star-delta transformation for the network shown in Fig.Q 2(a).	**08**	(2 :1 : 1.3.1)
	b.	Write the Mesh equations for the circuit shown in Fig. Q2 (b). Also, determine Mesh currents using Mesh analysis.	**06**	(2 :1 : 1.3.1)
	c.	The node voltage equations of a network are: $(1/5 + 1/j2 + 1/4)\ V_1 - 1/4\ V_2 = 50/0^0/5$ and $-1/4\ V_1 + (1/4 + 1/-j2 + 1/2)\ V_2 = 50/90^0/2$ Derive the network.	**06**	(2 :1 : 1.3.1)

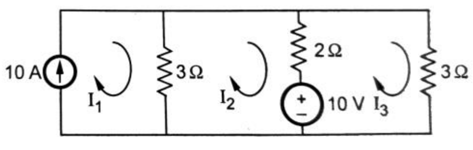

Fig. Q2 (b).

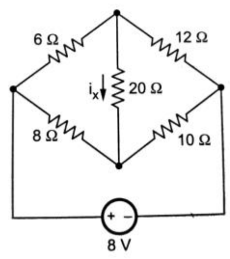

Fig. Q3 (b).

		Module-2		
3.	**a.**	State and prove superposition theorem.	**06**	(3 :2 : 1.3.1)
	b.	Find i_x and hence verify reciprocity theorem for the network shown in Fig. Q3 (b).	**07**	(3 :2 : 1.3.1)

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)

c. Determine current through Z_L using Millman's Theorem for the network shown in Fig.Q3(c). **07** (3 :2 : 1.3.1)

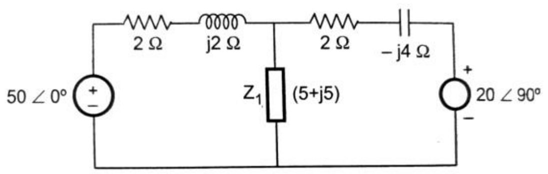

Fig. Q3 (c)

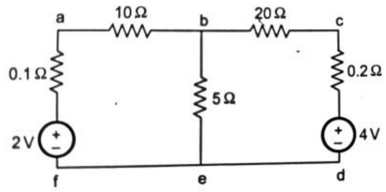

Fig. Q4 (b).

(OR)

4. a. State and prove Thevenin's Theorem. **06** (3 :2 : 1.3.1)

b. Obtain the current through branch 'b-e' using Norton's theorem for the network shown in Fig.Q4 (b). **07** (3 :2 : 1.3.1)

c. Determine R_{AB} for maximum power transfer. Also calculate maximum power for the network shown in Fig.Q4(c). **07** (3 :2 : 1.3.1)

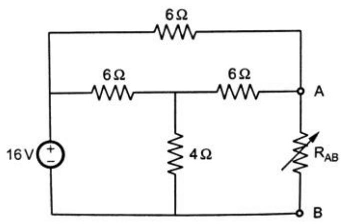

Fig. Q4(c).

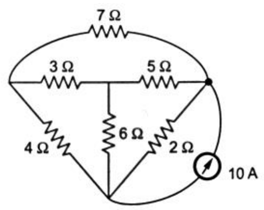

Fig.Q5 (b).

Module-3

5. a. Explain Incidence matrix of a network graph with suitable example. **06** (2 :3 : 1.3.1)

b. Draw the graph, select a tree, write the tie-set schedule and Obtain the equilibrium equations and hence currents in various branches for the circuit shown in Fig.Q5 (b). **10** (3 :3 : 1.3.1)

c. Draw the Dual network for the given circuit as shown in Fig.Q5(c). **04** (3 :3 : 1.3.1)

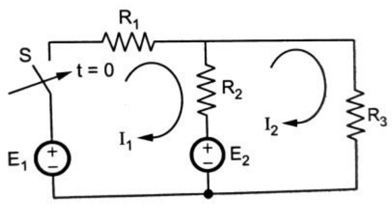

Fig.Q5(c).

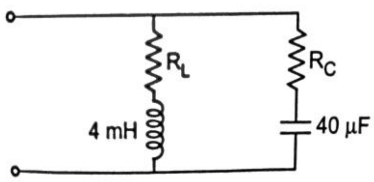

Fig.Q6(c).

(OR)

6. a. Show that Resonant frequency is geometric mean of two half power frequencies. **06** (2 :3 : 1.3.1)

b. Determine (i) Resonant frequency (ii) Maximum current in the circuit (iii) Q-factor of the circuit (iv) half power frequencies for the series RLC circuit consisting of a resistance 1 kΩ and an inductance of 100 mH in series with capacitance of 10 pF with voltage of 100 V is being applied across the combination. **10** (3 :3 : 1.3.1)

c. Determine R_L and R_C for which the circuit shown in Fig. Q6(c). Resonates at all frequencies. **04** (3 :3 : 1.3.1)

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)

Module-4

7. **a.** Prove that: **10** (3 :4 : 1.3.1)
(i) The voltage of a capacitor cannot change instantaneously.
(ii) The current in an inductor cannot change instantaneously.

b. Find value of i, di/dt, d^2i/dt^2 at $t=0^+$, if R=1 Ω, L=1 H, C=0.1 μF and V=100 V for the circuit shown in Fig.Q7 (b). The switch K is moved from a to b at t=0. Assume steady state is achieved, when switch K is at position a. **10** (3 :4 : 1.3.1)

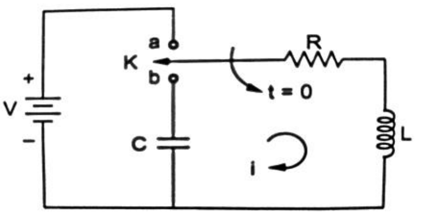

Fig.Q7(b).

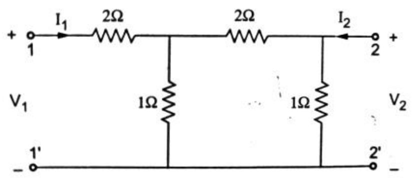

Fig.Q9(a).

(OR)

8. **a.** State and prove initial and final value theorem. **10** (3 :4 : 1.3.1)

b. Find the Laplace transform of (i) $\sin wt$ (ii) $\cos wt$ (iii) te^{-at} (iv) $e^{-at}\sinh(wt)$ **10** (3 :4 : 1.3.1)

Module-5

9. **a.** Obtain y-parameters and z-parameters for the network shown in Fig.Q9 (a). **10** (3 :5 : 1.3.1)

b. Determine the transmission parameters for the network shown in Fig. Q9 (b). **10** (3 :5 : 1.3.1)

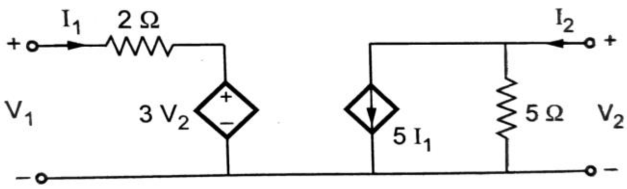

Fig. Q9 (b).

(OR)

10 **a.** Obtain z-parameters in-terms of y and T parameters. **10** (3 :5 : 1.3.1)

b. Show that when two networks are connected in series, the overall z-parameters are the sum of individual z-parameters of two networks. **10** (3 :5 : 1.3.1)

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Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)