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Course Code

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Third Semester B.E. Degree Examinations, September 2024

NETWORK 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

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
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Module-1

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|----|---|-----------|-----------------|
| 1. | a. With a neat sketch, illustrate the working principle of Ideal and practical voltage and current source. | 08 | (2 : 1 : 1.6.1) |
| | b. Using source transformation reduces the circuit shown in Fig. Q1(b) into voltage source between terminals A and B. | 06 | (2 : 1 : 1.6.1) |

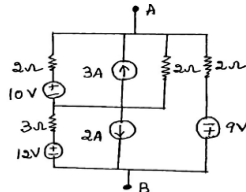


Fig. Q1(b)

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|----|--|-----------|-----------------|
| c. | For the circuit shown in Fig. Q1(c), find the equivalent resistance between two nodes using star-delta transformation. | 06 | (2 : 1 : 1.6.1) |
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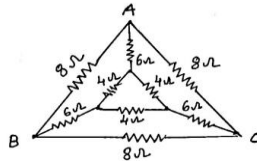


Fig. Q1(c)

(OR)

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|----|--|-----------|-----------------|
| 2. | a. Define electrical circuit. Explain passive elements of electrical circuit. | 08 | (2 : 1 : 1.6.1) |
| | b. Find the loop currents for the network shown in Fig. Q2(b) using mesh analysis. | 06 | (2 : 1 : 1.6.1) |

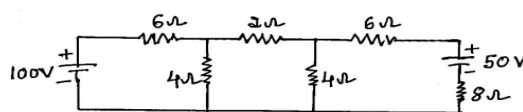


Fig. Q2(b)

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|----|---|-----------|-----------------|
| c. | Use the nodal analysis to find the voltage V_x in the circuit shown in the Fig. Q2(c), such that current through $(2+3j) \Omega$ is zero. | 06 | (2 : 1 : 1.6.1) |
|----|---|-----------|-----------------|

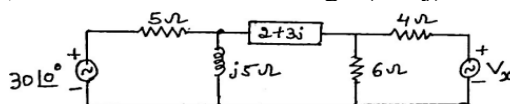


Fig. Q2(c)

Module-2

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|----|--|-----------|-----------------|
| 3. | a. State and prove the Norton's theorem. | 07 | (2 : 2 : 1.6.1) |
| | b. Find the current I, for the network shown in Fig. Q3(b), using superposition theorem. | 07 | (2 : 2 : 1.6.1) |

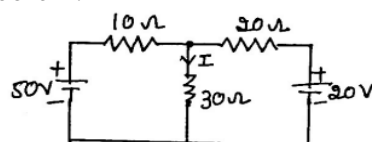


Fig. Q2(c)

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

- c. Find the voltage V_x across 2k resistor shown in Fig. Q3 (c), by using millman's theorem. **06** (2 :2: 1.6.1)

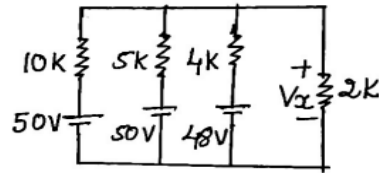


Fig. Q3(c)

(OR)

4. a. State and prove the Thevenin's theorem. **07** (2 :2: 1.6.1)
 b. Find the current through 30 Ω load resistor using Norton's theorem for the network shown in Fig. Q4(b). **07** (2 :2: 1.6.1)

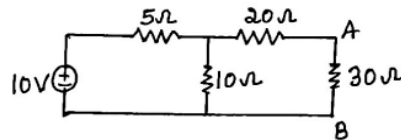


Fig. Q4(b)

- c. Verify reciprocity theorem for the voltage V and current I in the network shown in Fig. Q4(c). **06** (2 :2: 1.6.1)

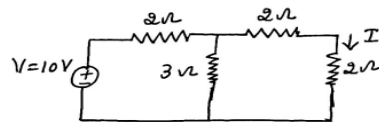


Fig. Q4(c)

Module-3

5. a. State and prove Initial Value theorem. **06** (2 :3 : 1.6.1)
 b. Find the Laplace transform of $f(t)$ shown in Fig. Q5(b). **07** (2 :3 : 1.6.1)

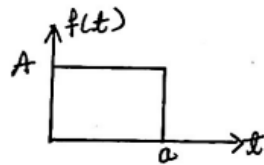


Fig. Q5(b)

- c. Find the first order unit step response of system using Simulink when system function is $1/s+1$. **07** (2 :3 : 1.6.1)

(OR)

6. a. Define Laplace transform. Explain properties of Laplace transform. **06** (2 :3 : 1.6.1)
 b. Find the Laplace transform of periodic signal $x(t)$ shown in Fig. Q6(b). **07** (2 :3 : 1.6.1)

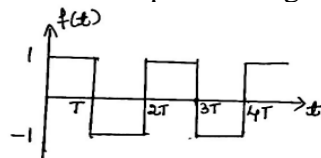


Fig. Q6 (b)

- c. Obtain the response of current $i(t)$ in the circuit shown in Fig. Q6(c) **07** (2 :3 : 1.6.1)

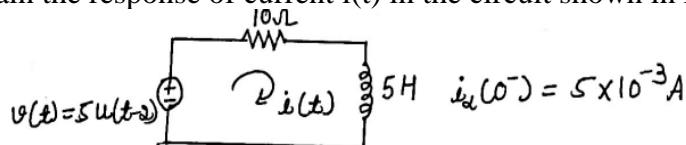


Fig. Q6(c)

Module-4

7. a. Find the quality factor of inductance and capacitance. **08** (2 :4 : 1.6.1)
 b. Define the following terms: **06** (2 :4 : 1.6.1)
 (i) Resonance (ii) Q-factor (iii) Bandwidth

- c. A 220 V, 100 Hz AC source supplies a series RLC circuit with a capacitor and a coil. If the coil has $50 \text{ m } \Omega$ resistance and 5 m H inductance at a resonance frequency of 100 Hz. Calculate the value of capacitor, Q factor and half power frequencies of the circuit. **06** (2 : 4 : 1.6.1)

(OR)

8. a. Prove that resonant frequency of series RLC circuit is geometric mean of half power frequencies. **08** (2 : 4 : 1.6.1)
 b. Define selectivity. Find the selectivity of series resonant RLC Circuit. **06** (2 : 4 : 1.6.1)
 c. Find the value of ω_{ar} , Quality factor, Bandwidth of parallel resonant RLC circuit if $R=25 \text{ } \Omega$, $L=0.5 \text{ H}$ and $C=5 \text{ } \mu\text{F}$. **06** (2 : 4 : 1.6.1)

Module-5

9. a. Derive the impedance parameters (Z) in terms of other parameters. **07** (2 : 5 : 1.6.1)
 b. Determine Z- Parameters of Circuit shown in Fig. Q9 (b). **06** (2 : 5 : 1.6.1)

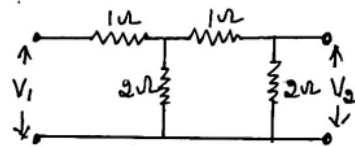


Fig. Q9 (b).

- c. Obtain admittance(Y) parameters of circuit shown in Fig. Q9 (c). **07** (2 : 5 : 1.6.1)

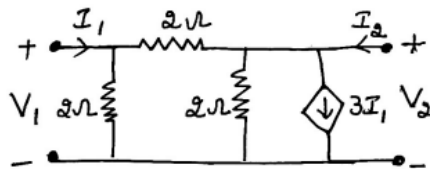


Fig. Q9 (c).

(OR)

- 10 a. Derive the hybrid parameters (h) in terms of other parameters. **07** (2 : 5 : 1.6.1)
 b. Determine h Parameters of Circuit shown in Fig. Q10 (b). **07** (2 : 5 : 1.6.1)

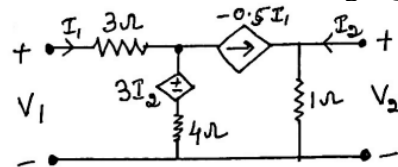


Fig. Q10 (b).

- c. Determine ABCD Parameters of Circuit shown in Fig. 10(c). **06** (2 : 5 : 1.6.1)

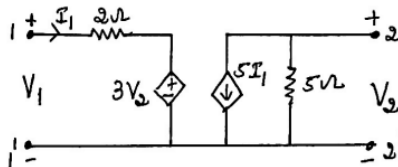


Fig. Q10 (c).

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