

# Electrical Network Analysis

## Sessional-I Exam

(EE2004)

Date: September 21<sup>st</sup>, 2024

Course Instructor(s)

Mr. Abdul Majid

Ms. Beenish Fatima

Mr. Haris Mujtaba

Total Time (Hrs): 1

Total Marks: 40

Total Questions: 2

Roll No

Section

Student Signature

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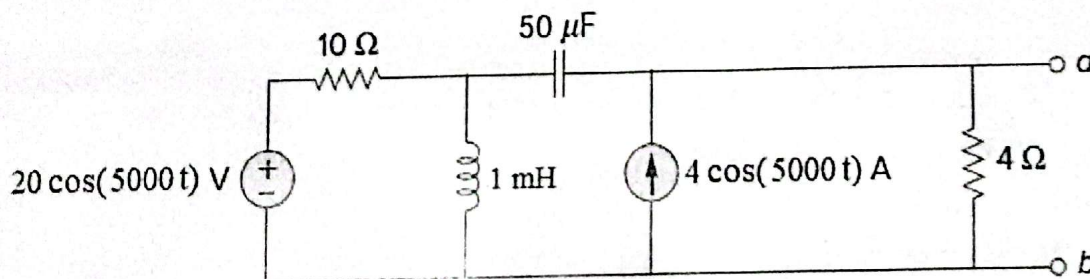
1. Attempt all the questions.
2. Attempt all parts of the same question together.
3. Show all the steps with proper labelled circuit diagrams, and answers with proper units.

CLO #1: Apply phasor-domain analysis to solve circuits containing R, L, C, and mutual inductance

Q1: Solve the circuit below to

[20 marks]

- a) Construct the frequency domain circuit
- b) Construct the Thévenin Equivalent circuit w.r.t. terminals 'a' and 'b' using source transformations
- c) Determine the steady state expression of Thévenin Equivalent voltage



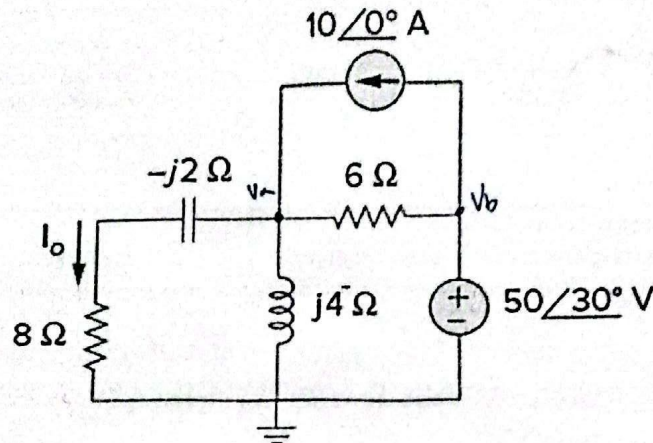
$V = 26.8 \angle 63.4^\circ \text{ V}$

CLO #1: Apply phasor-domain analysis to solve circuits containing R, L, C, and mutual inductance

[20 marks]

Q2:

- Calculate the current  $I_o$  in the circuit shown below using node voltage method
- Determine the expression of  $i_o(t)$



$$I_o: +50\angle 30^\circ + \frac{V_b - V_a}{6} + (10\angle 0^\circ) = 0$$

$$V_a = 403.07\angle 25.7^\circ \text{ V}$$

$$\frac{V_a}{j4} + \frac{V_a - V_b}{6} - 10\angle 0^\circ + (8 - 2j)I_o = 0$$

$$86.86 - 66.0j + (8 - 2j)I_o = 0$$

$$I_o = 13.2\angle 156.8^\circ \text{ A}$$

$$I_o = -12.6 + 5.21j \text{ A}$$

$$\frac{V_a}{2j} + \frac{V_a}{14} + \frac{V_a - 50\angle 30^\circ}{6} - 10\angle 0^\circ = 0$$

$$\left(\frac{1}{8} - \frac{1}{2j} + \frac{1}{14} + \frac{1}{6}\right)V_a - \frac{50\angle 30^\circ}{6} - 10\angle 0^\circ = 0$$

$$(0.291 + 0.25j)V_a = 17.21 + 4.16j$$

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$$V_a = 46.1\angle -27.07^\circ$$

$$V = \frac{1}{\sqrt{2}} \sqrt{(-12.6)^2 + (5.21)^2} = 5.7\angle 63^\circ$$