



SCHOOL OF COMPUTING AND ENGINEERING SCIENCES
BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING
BEE1201: CIRCUIT THEORY I
END OF SEMESTER EXAM

Date: 19th March 2025

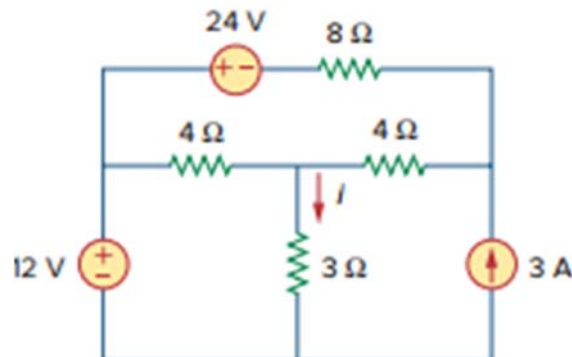
Time: 16.00 - 19.00

Instructions:

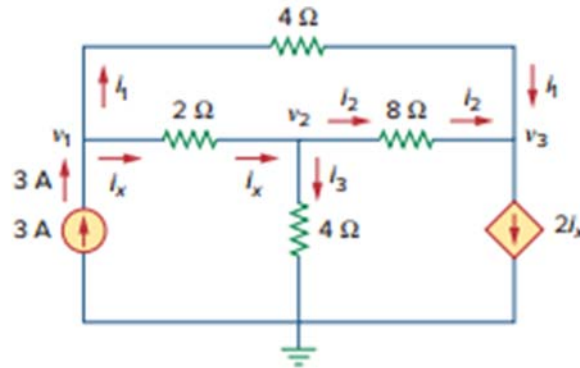
1. This Examination consists of **FIVE** questions
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

Question 1

1. For the circuit shown below, use superposition principle to find i . (5marks)



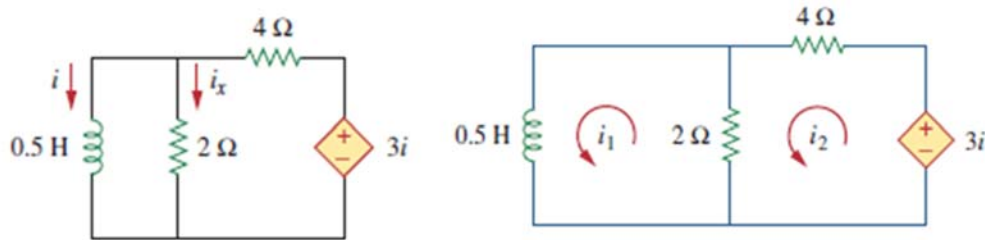
2. Find the power delivered to an element at $t = 3\text{ms}$ if the current entering the positive terminal is $i = 5 \cos 60\pi t \text{ A}$ and the voltage is:
 - a. $v = 3i$ (2marks)
 - b. $v = 3 di/dt$ (4marks)
3. In the figure shown below, determine the voltages at the nodes using Cramer's rule (5marks)



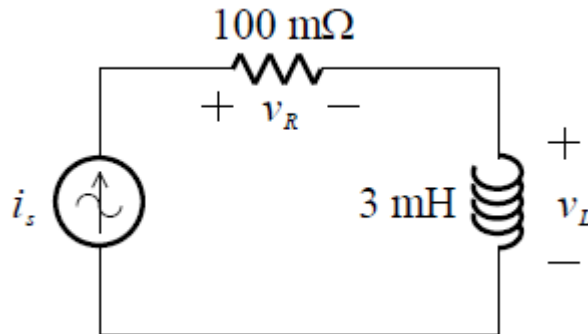
4. Find $[z]$ and $[g]$ of a two-port network if (6marks)

$$[T] = \begin{bmatrix} 10 & 1.5\Omega \\ 2S & 4 \end{bmatrix}$$

5. Assuming that $i(0) = 10A$, calculate $i(t)$ and $i_x(t)$ in the circuit below: (5marks)



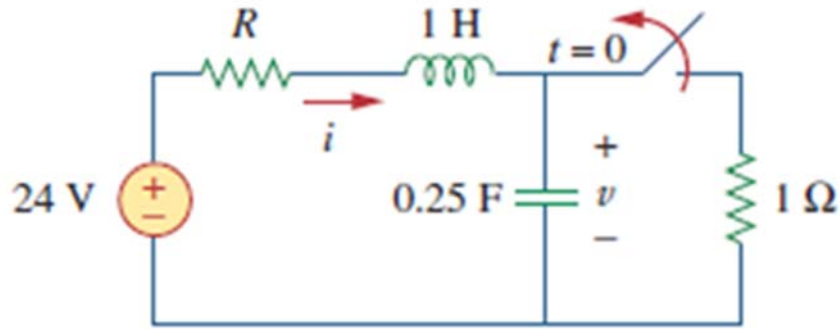
6. A sinusoidal current source is connected in series with a $100\text{ m}\Omega$ resistor and a 3 mH inductor, as shown below. Calculate the power delivered to the inductor and the energy stored? Let $i_s = 12 \sin(100\pi t)\text{ A}$ (3marks)



Question 2

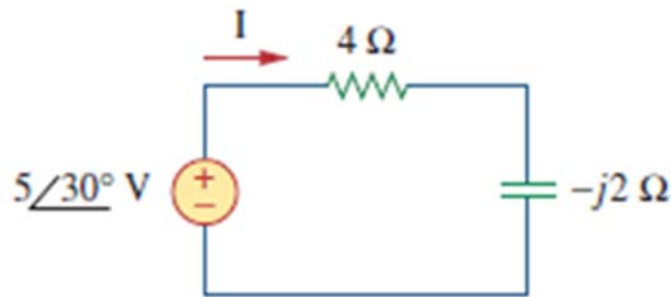
1. For the circuit shown, find $v(t)$ and $i(t)$ for $t > 0$. Consider these cases: (15marks)

- $R = 5\Omega$
- $R = 4\Omega$
- $R = 1\Omega$

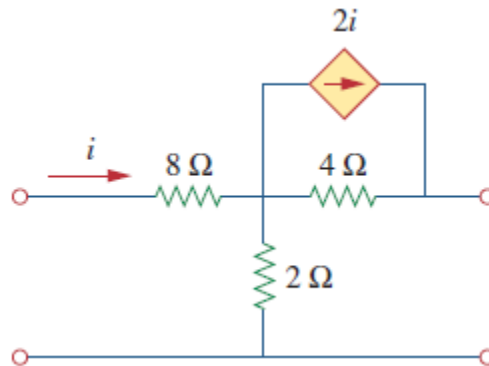


Question 3

1. For the circuit shown below, find the average power supplied by the source and the average power absorbed by the resistor. (5marks)

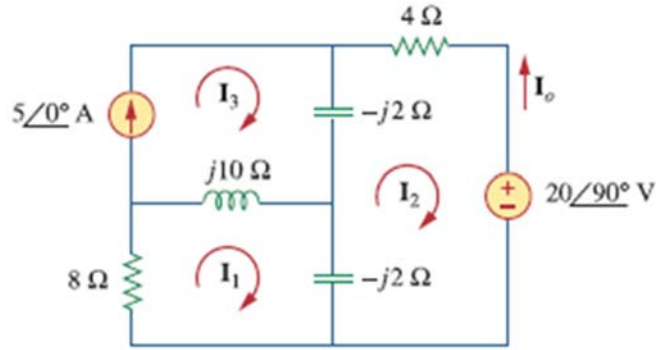


2. Determine the y parameters for the two-port shown below (10marks)

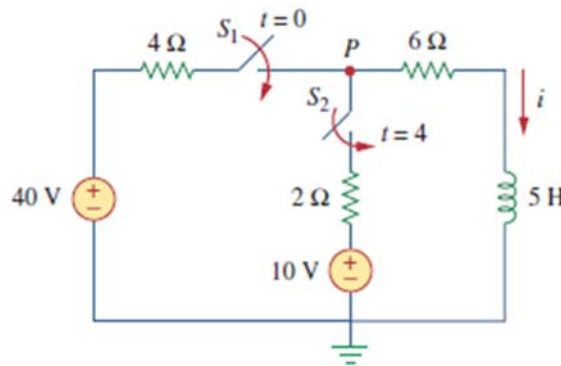


Question 4

1. Determine the current I_o in the circuit shown below using mesh analysis (5marks)

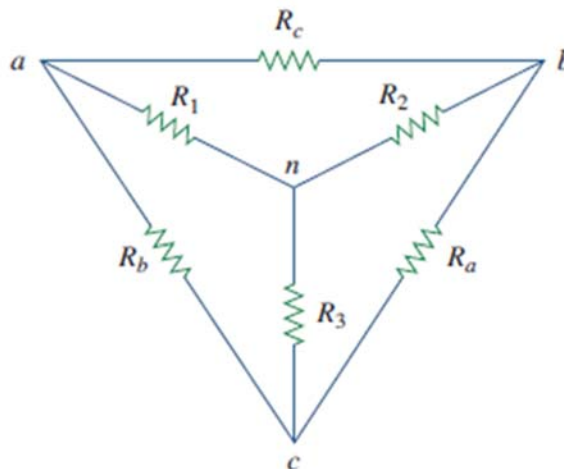


2. Explain the three factors that determine the value of capacitance (3marks)
3. At $t = 0$, switch 1 in the figure below is closed, and switch 2 is closed 4s later. Find $i(t)$ for $t > 0$. Calculate I for $t=2s$ and $t=5s$ (7marks)



Question 5

1. Given the circuit below, show the conversion from delta to Wye and wye to delta, hence find their equations (6marks)



2. Obtain the equivalent resistance for the circuit in the figure below and find the current i (9marks)

