ID: Name:

Brac University
Semester: Summer 2023
Course Code: CSE250
Circuits And Electronics
Section: 23
Faculty: PRM

Set

A

BRAC
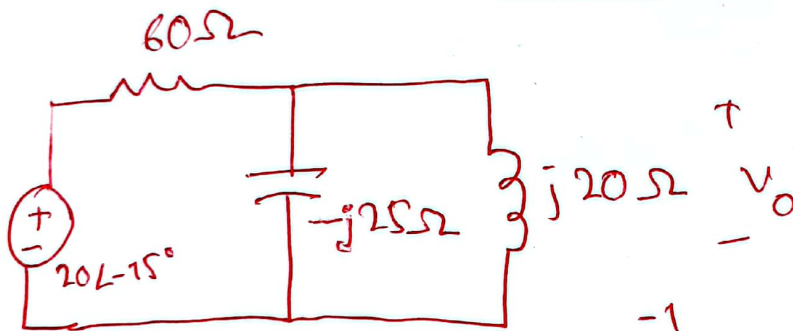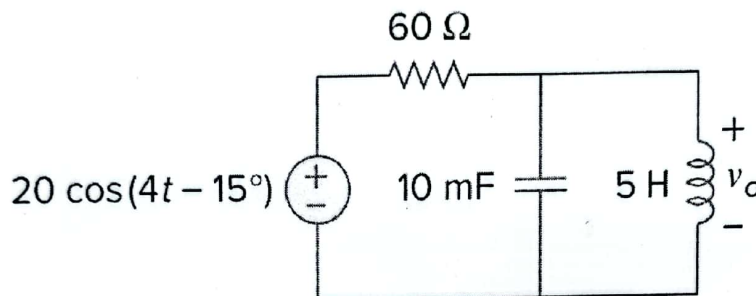UNIVERSITY

Inspiring Excellence

Assessment: *Quiz-5*
Full Marks: 20

✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
✓ At the end of the exam, the **answer script** must be returned to the invigilator.
✓ **All questions** are compulsory. Marks allotted for each question are mentioned beside each question.
✓ Symbols have their usual meanings.

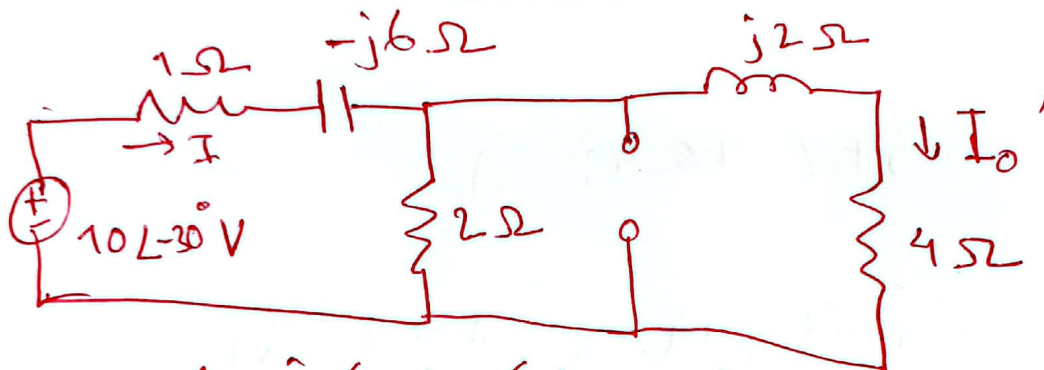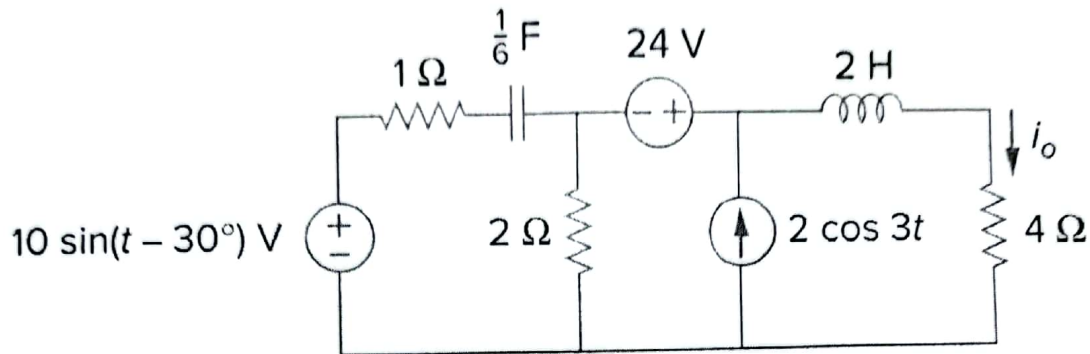■ **Question 1 of 2** *[CO3] [5 marks]*

Calculate $v_o(t)$

$$60\ \Omega$$

$$20\cos(4t - 15°)$$ 10 mF   5 H $+ \atop v_o \atop -$

$$z_p = \left(\frac{1}{-j25} + \frac{1}{j20}\right)^{-1} = j100\ \Omega$$

$$\therefore V_o = \frac{z_p}{60 + z_p} \times 20\angle{-15°} = 17.15\angle{15.96°}\ V$$

$$\therefore v_o(t) = 17.15\cos(4t + 15.96°)\ V$$
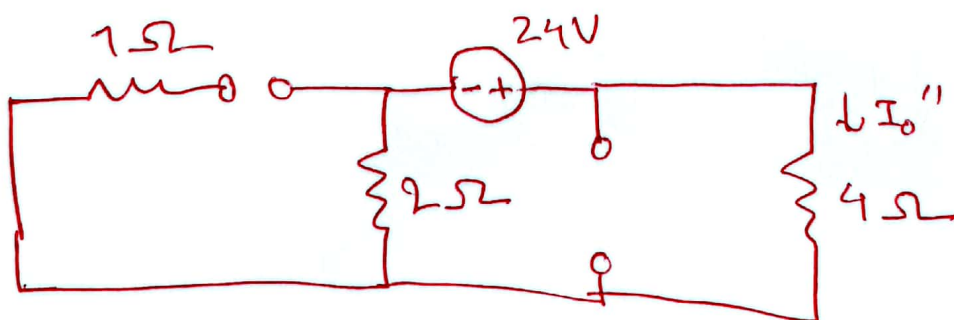
■ **Question 2 of 2**   [CO3]   [15 marks]

Calculate $i_o(t)$ using Superposition Principle.

$$Z_{eq} = 1 - j6 + \left(\frac{1}{2} + \frac{1}{j2+4}\right)^{-1} = (2.4 - j5.8)\,\Omega$$

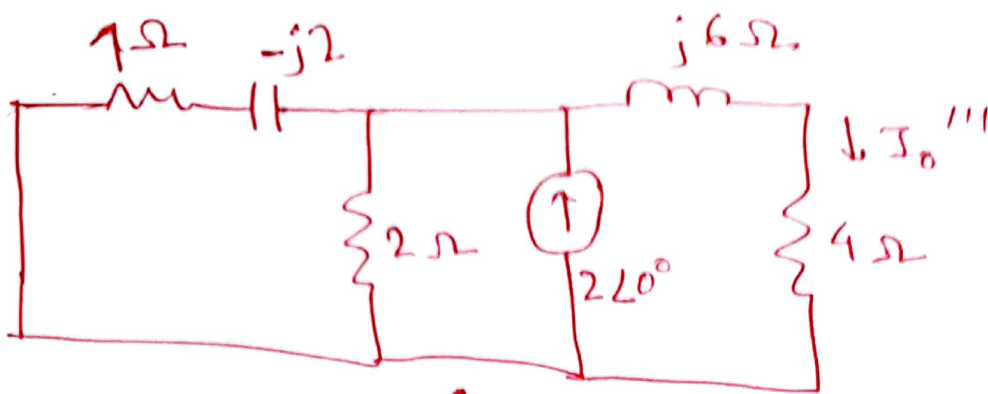$$\therefore I = \frac{10\angle{-30°}}{Z_{eq}} = 1.59\angle{37.52°}\ A$$

$$\therefore I_o' = \frac{2}{2+j2+4} \times 1.59\angle{37.52°} = 0.5\angle{19.09°}\ A$$

$$\downarrow I_o'' \qquad I_o'' = \frac{24}{2+4}$$

$$= 4\,A$$

The circuit shows: $1\,\Omega$ resistor, $-j2$ capacitor, $j6\,\Omega$ inductor, $2\,\Omega$ resistor, current source $2\angle 0°$, $4\,\Omega$ resistor, and $\downarrow I_o'''$.

$$I_o''' = \frac{\dfrac{1}{j6+4}}{\dfrac{1}{1-j2} + \dfrac{1}{2} + \dfrac{1}{j6+4}} \times 2\angle 0°$$

$$= 0.34 \angle -76.43° \; A$$

$$\therefore \; i_o(t) = 0.5\sin(t + 19.09°) + 4 + 0.34\cos(3t - 76.43°) \; A$$