ID:	Name:

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

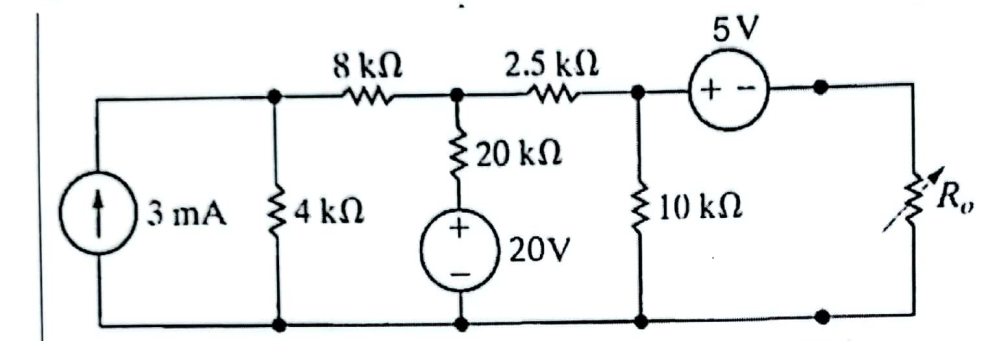
Set **A**

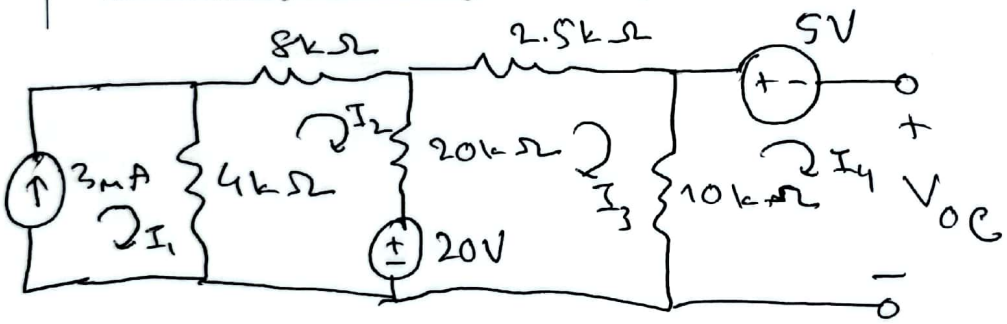
Assessment: *Quiz-3*
Full Marks: 20

- ✓ 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 *[CO1] [10 marks]*

Determine the value of V_{th}, I_N and R_{th} of the following circuit considering R_o as the load. Then **draw** either the Thevenin or Norton equivalent circuit.





$I_1 = 3mA$, $I_4 = 0mA$ (as open circuit)

Applying KVL to mesh 2,

$4(I_2 - I_1) + 8I_2 + 20(I_2 - I_3) + 20 = 0$

or, $32I_2 - 20I_3 = -8$ ——— (i)

Applying KVL to mesh 3,

$-20 + 20(I_3 - I_2) + 2.5I_3 + 10I_3 = 0$

or, $-20I_2 + 32.5I_3 = 20$ ——— (ii)

Solving equations (i) and (ii) we get,

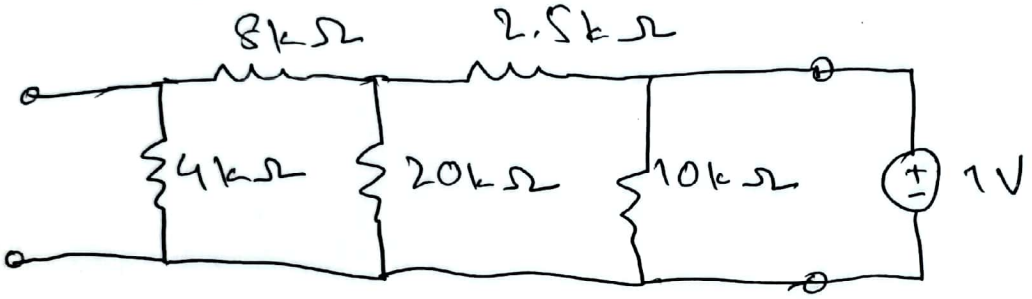
$I_2 = 0.22mA$, $I_3 = 0.75mA$

Applying KVL to mesh 4,

$-10I_3 + 5 + V_{oc} = 0$

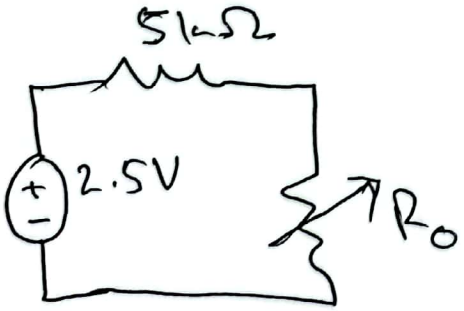
or, $V_{oc} = 10I_3 - 5 = 2.5V = V_{th}$

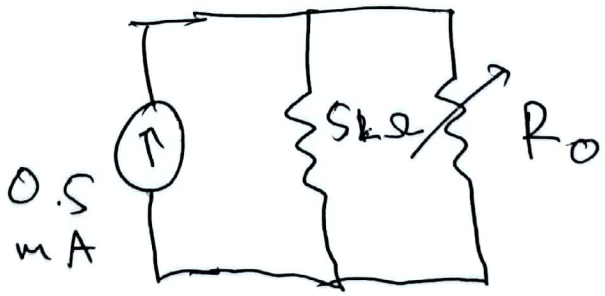
For R_{th} =>



$\therefore R_{th} = 10 \| [2.5 + 20 \| (8+4)]$

$= 5k\Omega$

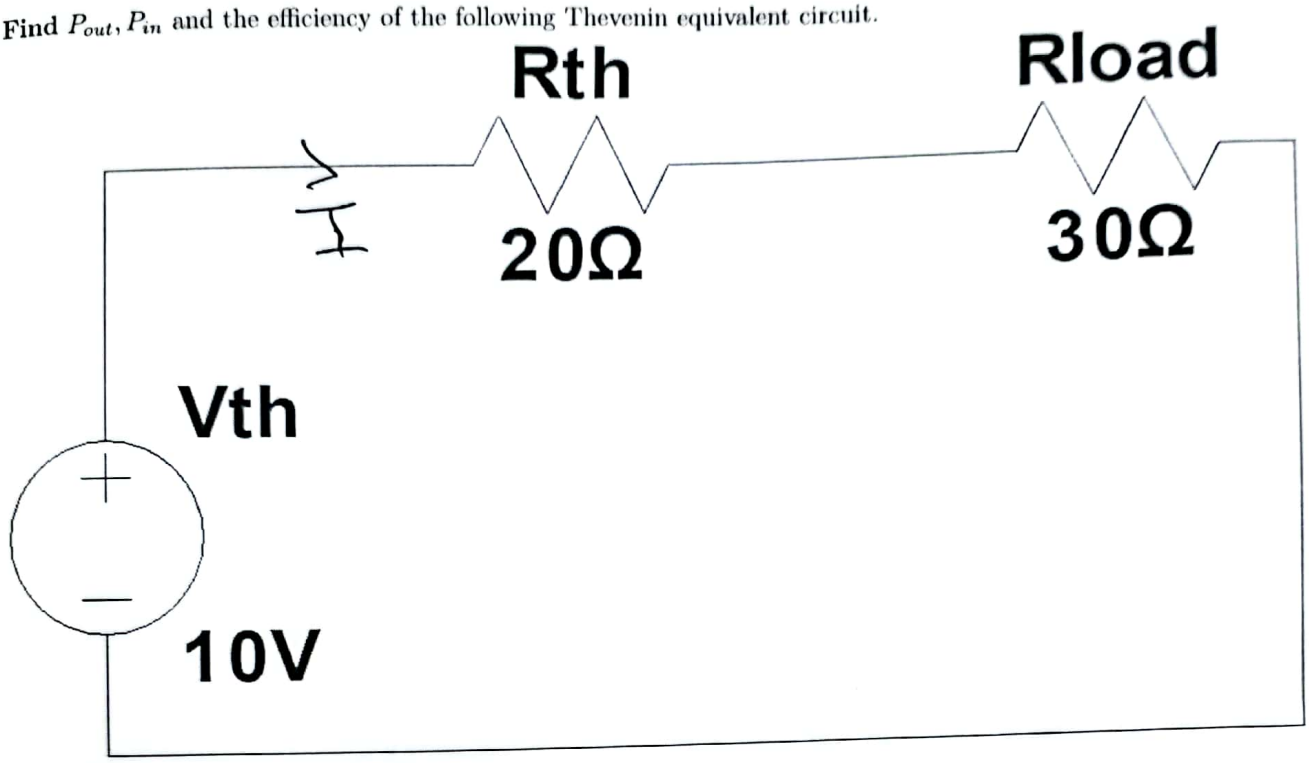




$$I_N = \frac{V_{th}}{R_{th}} = 0.5mA$$

■ Question 2 of 2 *[CO2] [10 marks]*

Find P_{out}, P_{in} and the efficiency of the following Thevenin equivalent circuit.



$R_{eq} = 20+30 = 50\Omega$

$I = \frac{V_{th}}{R_{eq}} = \frac{10}{50} = 0.2A$

$P_{out} = I^2 R_{load} = 0.2^2 \times 30 = 1.2W$

$P_{in} = V_{th} I = 10 \times 0.2 = 2W$

Efficiency, $\eta = \frac{P_{out}}{P_{in}} \times 100\%$

$= \frac{1.2}{2} \times 100\%$

$= 60\%$

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Circuits And Electronics
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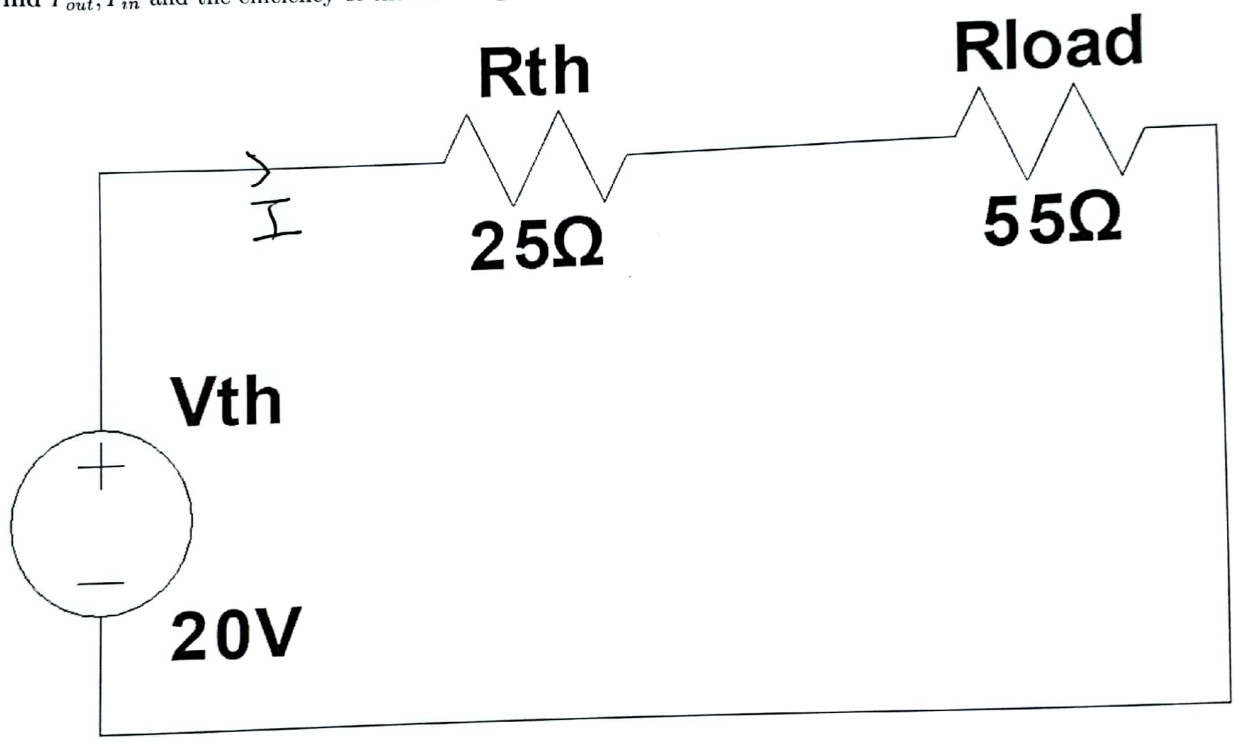
Set **B**

Assessment: *Quiz-3*
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 *[CO2] [10 marks]*

Find P_{out}, P_{in} and the efficiency of the following Thevenin equivalent circuit.



$R_{eq} = 25 + 55 = 80\Omega$

$I = \frac{V_{th}}{R_{eq}} = \frac{20}{80} = 0.25A$

$\therefore P_{out} = I^2 R_{load} = 0.25^2 \times 55 = 3.4375W$

$P_{in} = V_{th} I = 20 \times 0.25 = 5W$

$\therefore$ Efficiency, $\eta = \frac{P_{out}}{P_{in}} \times 100\% = \frac{3.4375}{5} \times 100\%$

$= 68.75\%$

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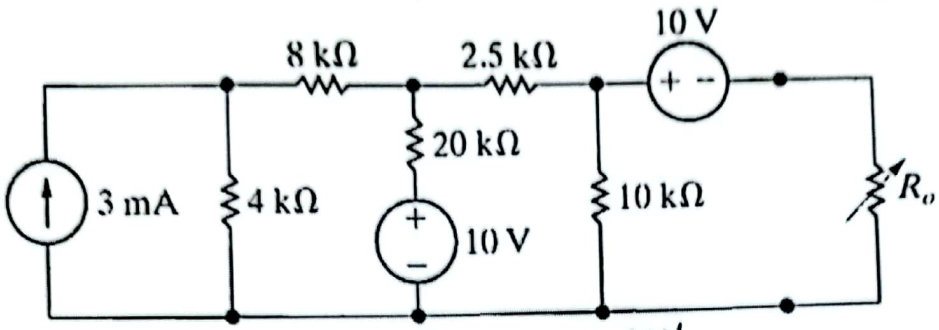
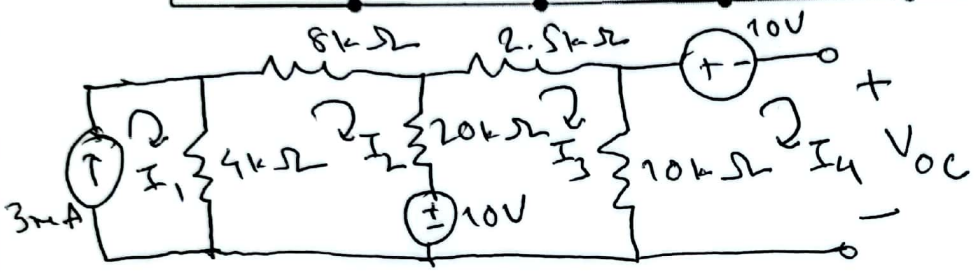
■ Question 2 of 2 *[CO1] [10 marks]*

Determine the value of V_{th}, I_N and R_{th} of the following circuit considering R_o as the load. Then **draw** either the Thevenin or Norton equivalent circuit.





$I_1 = 3mA$, $I_4 = 0mA$ (as open circuit)

Applying KVL on mesh-2,

$4(I_2 - I_1) + 8I_2 + 20(I_2 - I_3) + 10 = 0$

or, $32I_2 - 20I_3 = 2$ ——— (i)

Applying KVL on mesh-3,

$-10 + 20(I_3 - I_2) + 2.5I_3 + 10I_3 = 0$

~~or, $-20I_2 + 32.5I_3 = 10$~~.

or, $-20I_2 + 32.5I_3 = 10$ ——— (ii)

Solving equations (i) and (ii) we get,

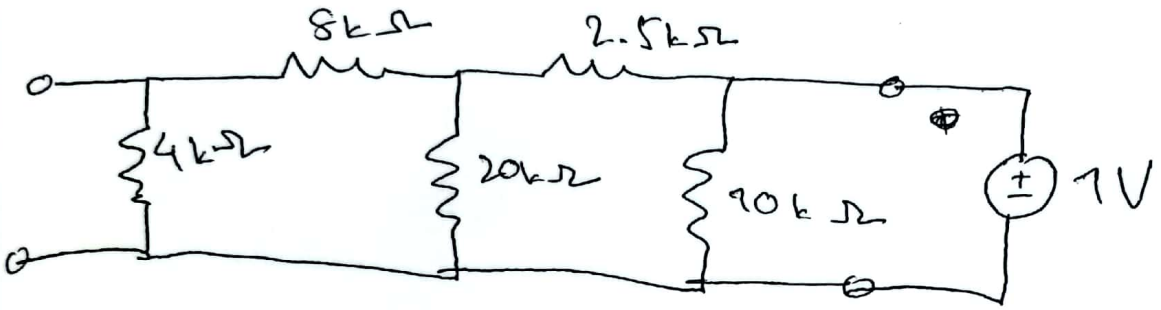
$I_2 = 0.47mA$, $I_3 = 0.56mA$

Applying KVL to loop 4,

$$-10I_3 + 10 + V_{OC} = 0$$

or, $V_{OC} = 10I_3 - 10 = -4.4V = V_{th}$

For R_{th} =>



$$\therefore R_{th} = 10 \,||\, [2.5 + 20 \,||\, (8+4)]$$

$$= 5k\Omega$$

$$\therefore I_N = \frac{V_{th}}{R_{th}} = -0.88 mA$$