INTERNATIONAL BRANCH OF CAIRO UNIVERSITY
FACULTY OF COMPUTERS AND ARTIFICIAL INTELLIGENCE
MIDTERM EXAM

Examiner : Dr. Mustafa M. Shiple
Subject: Electronics Circuits (ELEC I)
Score: 20 Marks

Term: Fall 2023
Exam Time:60 min

ANSWER THE FOLLOWING QUESTIONS:

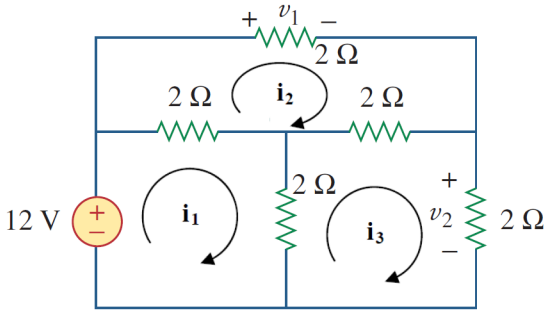
1. Determine v_1, v_2, I_1, I_2, and I_3 in the shown circuit (Use Mesh analysis technique) [5 marks] [A_q,C_a]

A. 6V, 6V , 6A, 3A, 3A.

B. 2V, 2V , 4A, 1A, 1A.

C. 0V, 2V , 3A, 0A, 1A.

D. infinite solutions.



Solution: solution (A)

$$12 = 4i_1 - 2i_2 - 2i_3 \quad (1)$$
$$0 = 6i_2 - 2i_1 - 2i_3 \longrightarrow 3i_2 = i_1 + i_3 \quad (2)$$
$$0 = 6i_3 - 2i_1 - 2i_2 \longrightarrow 3i_3 = i_1 + i_2 \quad (3)$$

from (2) and (3)

$$i_2 = i_3 \quad (4)$$

Substitute (4) in (1)

$$i_1 = i_2 + 3 \quad (5)$$

substitute (4) and (5) in (2).

$$i_2 = 3A$$

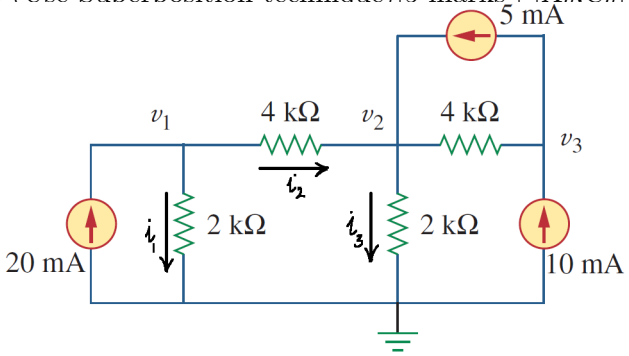
2. Determine v_1, v_2, v_3, I_1, I_2, and I_3 in the shown circuit (Use Superposition technique)[5 marks] [A_q,C_a]

A. 35V, 45V , 55V, 17.5mA, -2.5mA, 22.5mA.

B. 24V, 34V , 40V, 12.5mA, 2.5mA, 17mA.

C. 35V, 25V , 45V, 17.5mA, 2.5mA, 12.5mA.

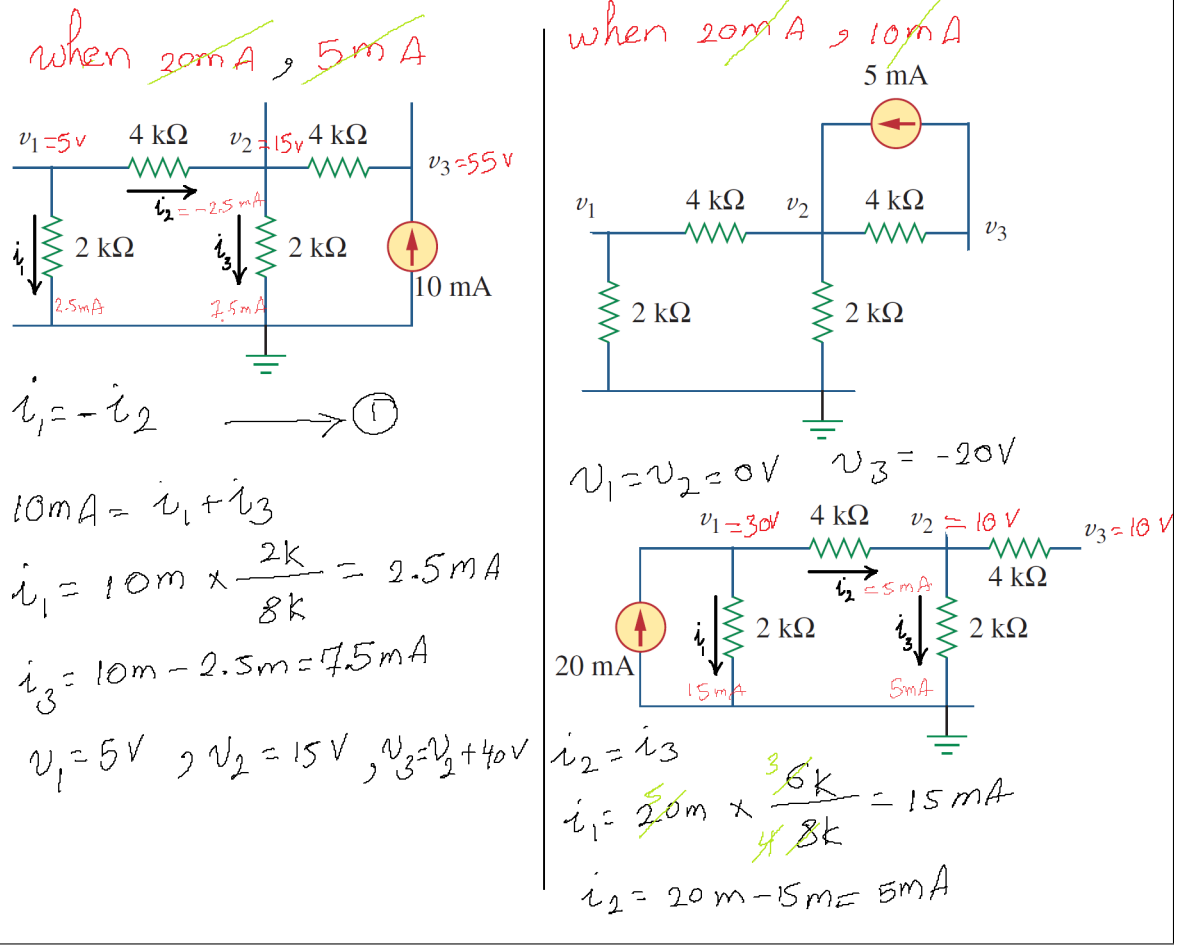
D. 40V, 20V , 0V, 20mA, 5mA, 10mA.



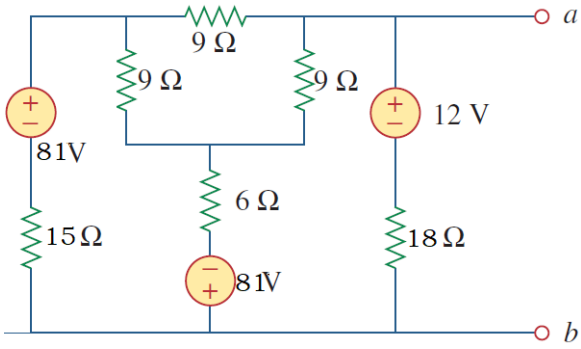
[Total Marks is 20]

Good Luck

Solution: solution (C)



3. Determine R_{th}, and v_{th} in the shown circuit [10 marks] [A$_a$.C$_a$]



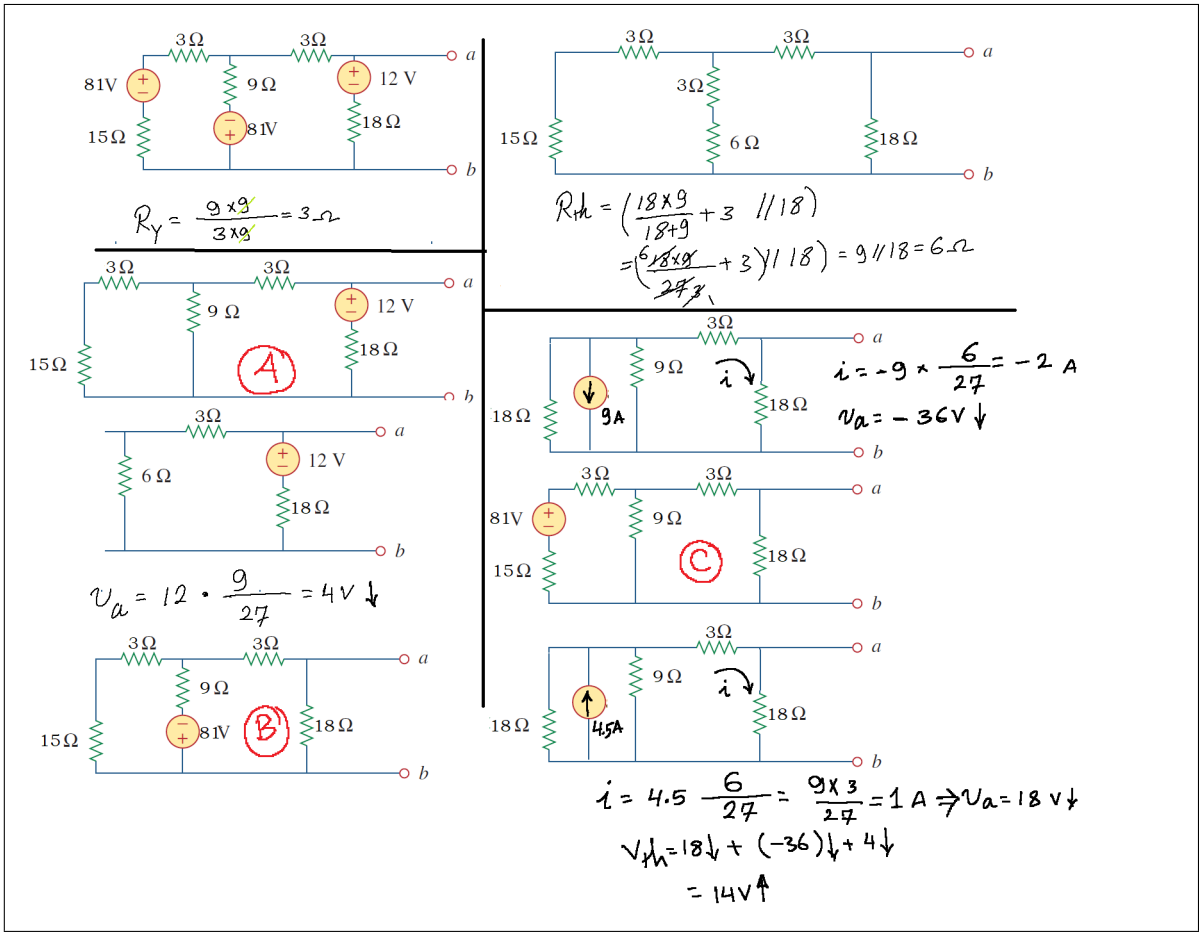
A. 9Ω , $10V\downarrow$.

B. 6Ω , $14V\uparrow$.

C. 18Ω , $12V\uparrow$.

D. 12Ω , $20V\uparrow$.

Solution: solution (B)


3Ω
3Ω
81V
9Ω
12 V
15Ω
81V
18Ω
a
b
$R_Y = \frac{9\times9}{3\times9} = 3\Omega$
3Ω
3Ω
9Ω
12 V
15Ω
18Ω
A
6Ω
$V_a = 12 \cdot \frac{9}{27} = 4V \downarrow$
9Ω
81V
15Ω
18Ω
B
3Ω
3Ω
6Ω
18Ω
$R_{th} = \left(\frac{18\times9}{18+9} + 3 \;//18\right)$
$= \left(\frac{6\times18\times9}{27\times3} + 3\right)// 18) = 9//18 = 6\Omega$
9Ω
9A
18Ω
$i = -9 \times \frac{6}{27} = -2\ A$
$V_a = -36V \downarrow$
81V
15Ω
C
4.5A
$i = 4.5\ \frac{6}{27} = \frac{9\times3}{27} = 1\ A \Rightarrow V_a = 18\ V \downarrow$
$V_{th} = 18\downarrow + (-36)\downarrow + 4\downarrow$
$= 14V \uparrow$