Total Number of Pages in this answer script (including the top page): 14

EXAMINATION SCRIPT

STUDENT ID.							
2	2	3	0	1	0	6	1

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DEPARTMENT:	CSE
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NAME	Fajaz Abrar Zaman Pronoy					SET	L
COURSE NO.	CSE250	SEMESTER	Fall-23	DATE	09-11-23		
COURSE TITLE	Circuits and Electronics						

Answer Script

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Please carefully read and sign the declaration below.

On my honour, I am bearing Student ID 22301061 hereby declare that, on this take of home assessment, I shall not misuse, in any form or method, the course materials including Lecture Notes, Reading Materials, Audio and Video Records of the lectures of this course. I shall not adopt any unfair means during the Examination and shall not receive any help or offer/ provide help to anyone, join intentionally or unintentionally any online or offline group in which answers of this assessment are posted or discussed, or engage in any behavior that would commonly be deemed to be academically unethical. I will immediately notify the invigilator of any such activity or online or offline groups that I become aware of. I shall preserve hard copy and soft copies of the answer scripts and will not expose the same to any person/party/media. I agree to accept any punitive measure taken by BRAC Authority if at any time during or after the completion of the course it is revealed/ violated otherwise. I acknowledge that I may be suspended or expelled from Brac University if I am found to have engaged in any academically unethical behavior.

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2. Use offset/normal white paper of A4 size for writing the answer. Use only one side of the paper for writing. On each page, clearly write your Student ID and Page numbers.
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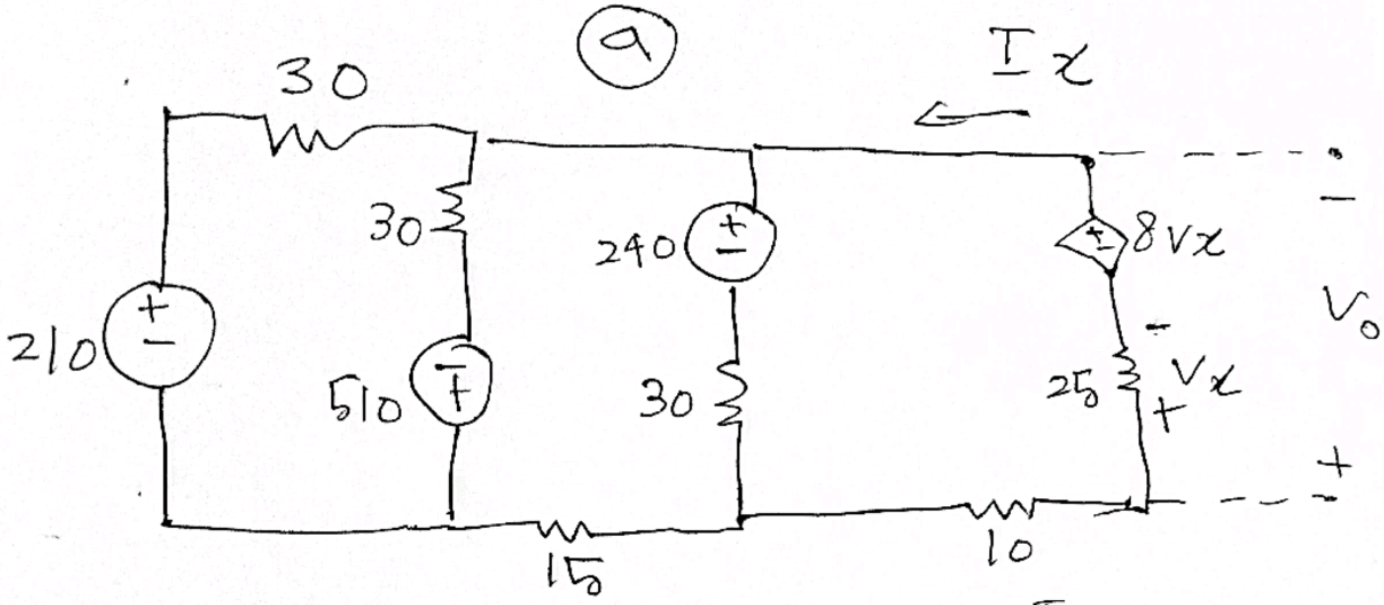
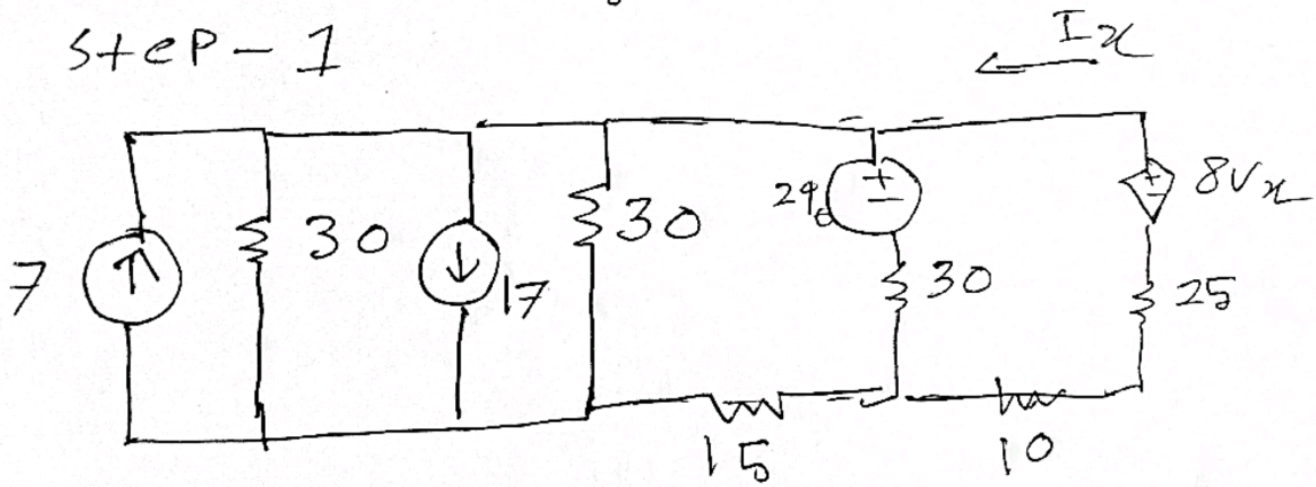
6. After completing the exam, before scanning, please write the total number of pages in this section (including the top page) on the top right corner of the top page.
7. You must submit within the designated submission time. Late submissions will not be accepted.

Ans. to the Q. No - 1

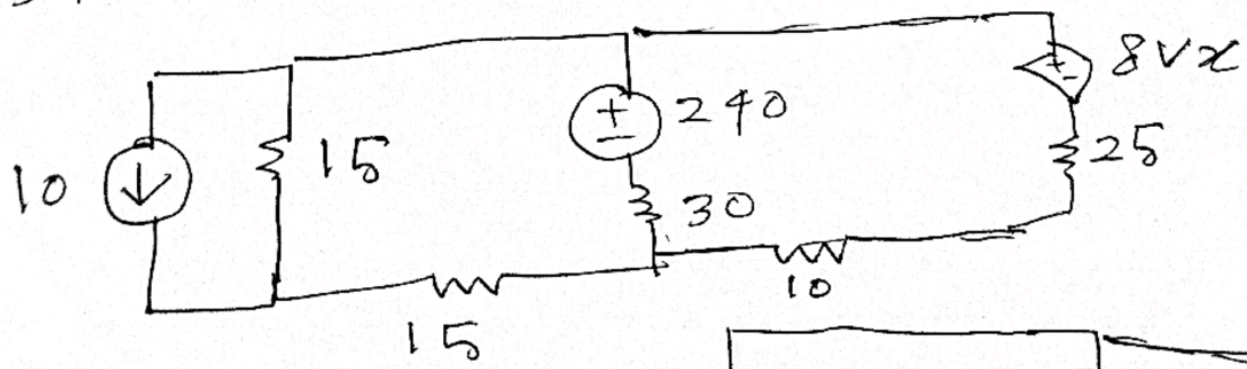
(a)



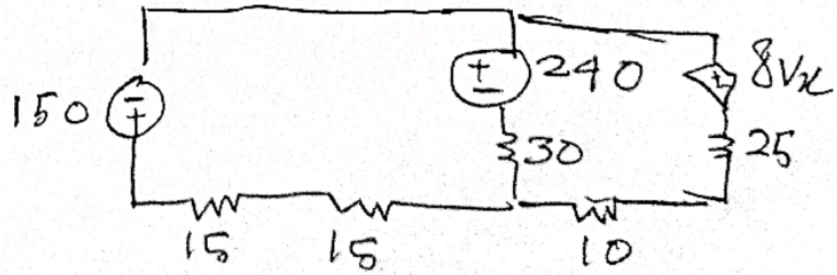
step - 1



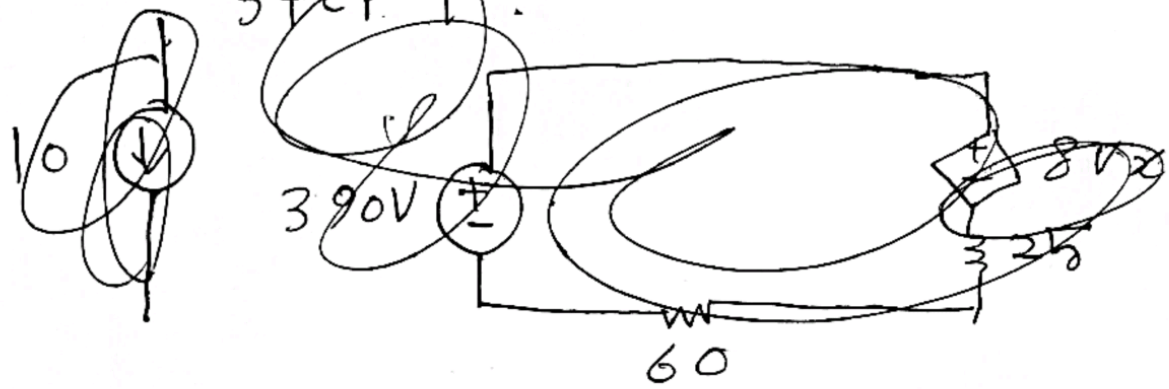
step - 2

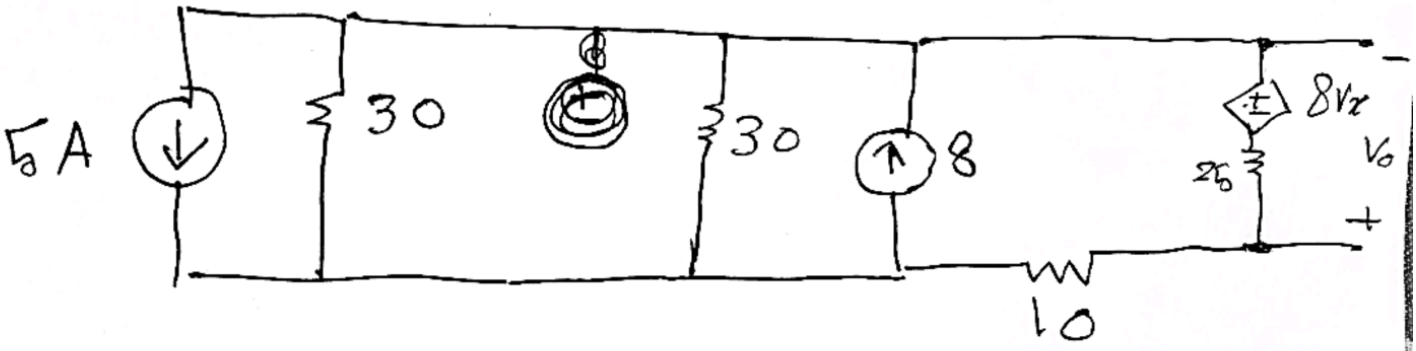


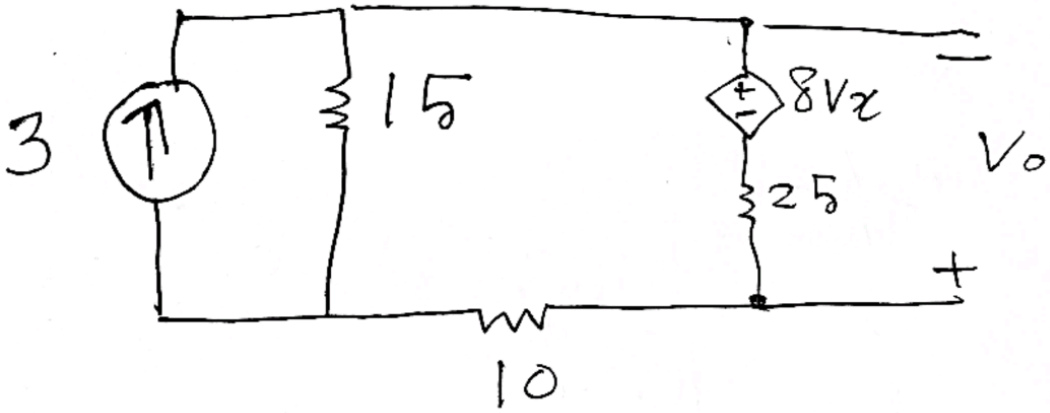
step 3 :

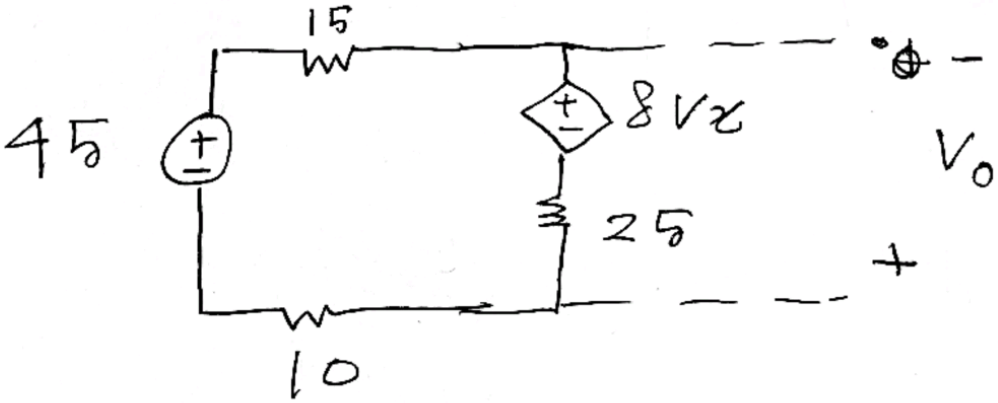


Step 4:





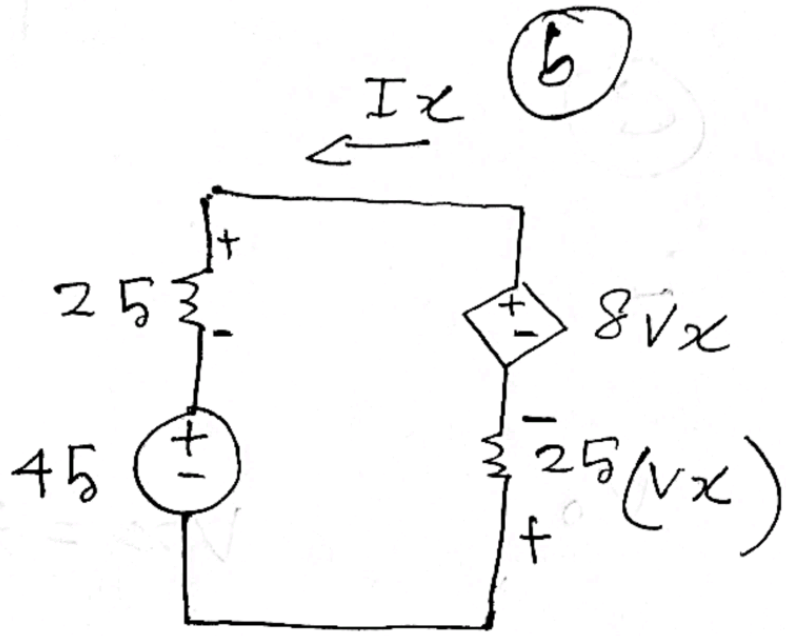




$\therefore \quad R' = 10 + 15 = 25\,\Omega$

$V' = 45\,V$

6



$$-45 - 25I_x + 8V_x - 25I_x = 0$$

$$\Rightarrow 8V_x - V_x - V_x = 45$$

$$\Rightarrow 6V_x = 45$$

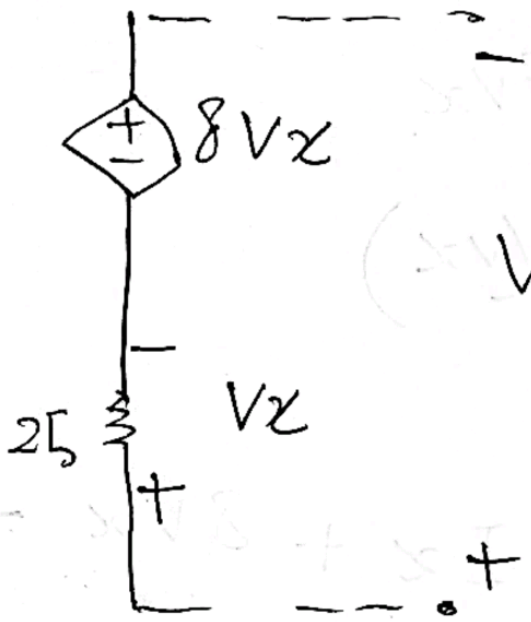
$$\Rightarrow V_x = 7.5V$$

$$V_x = 25I_x$$

$$\Rightarrow I_x = \frac{V_x}{25}$$

$$= \frac{7.5}{25} = 0.3A$$

(c)



$V_x = 7.5V$

$$V_x - 8V_x - V_o = 0$$

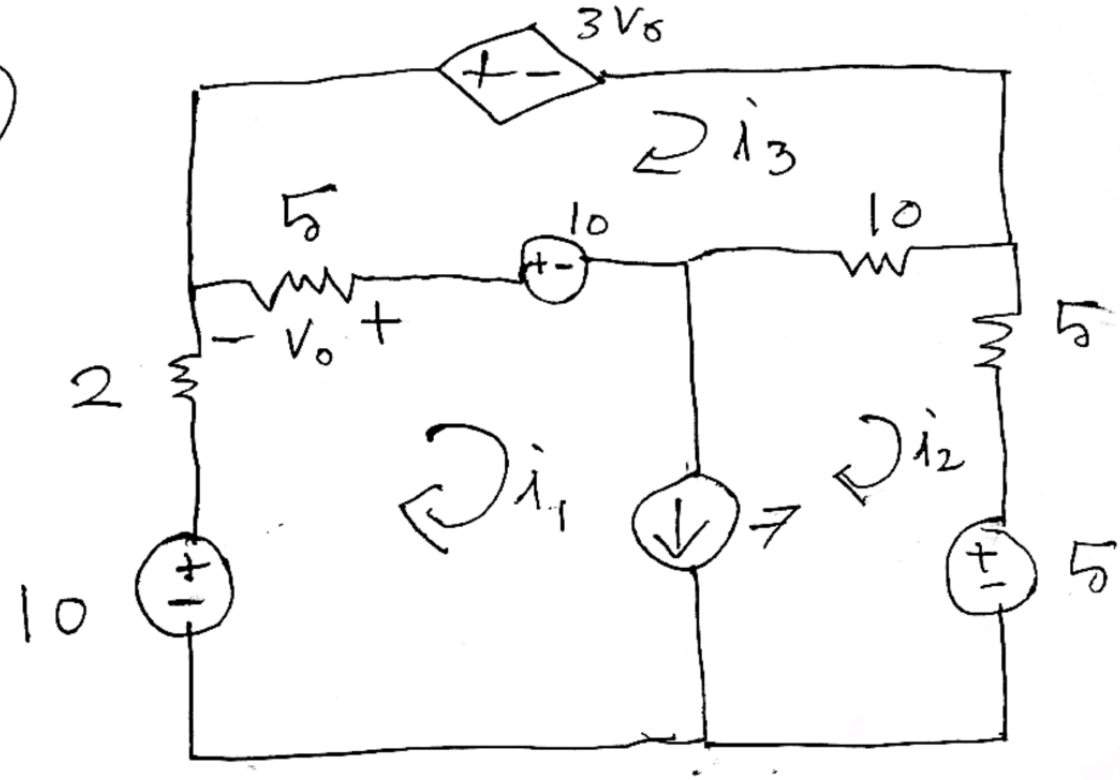
$$\Rightarrow -7V_x = V_o$$

$$\Rightarrow V_o = -7 \times 7.5$$

$$= -52.5V$$

Ans. to the Q. No-2

(a)



$$i_1 - i_2 = 7$$

KVL at M-1 and M2 supermesh

$$-10 + 2i_1 + 5(i_1 - i_3) + 10 + 10(i_2 - i_3) + 5i_2 + 5 = 0$$

$$\Rightarrow \underbrace{2i_1 + 5i_1} - 5i_3 + 10i_2 - 10i_3 + 5i_2 = -5$$

$$\Rightarrow 7i_1 + 15i_2 - 15i_3 = -5$$

KVL at M-3,

$$3V_o + 10(i_3 - i_2) - 10 + 5(i_3 - i_1) = 0$$

$$\Rightarrow 3 \times 5(i_3 - i_1) + 10(i_3 - i_2) + 5(i_3 - i_1) = 10$$

$$\Rightarrow 20(i_3 - i_1) + 10(i_3 - i_2) = 10$$

$$\Rightarrow 20i_3 - 20i_1 + 10i_3 - 10i_2 = 10$$

$$\Rightarrow -20i_1 - 10i_2 + 30i_3 = 10$$

∴ Mesh currents are,

$i_1 = 10mA$

$i_2 = 3mA$

$i_3 = 8mA$

(b)

$3V_o = 3 \times 5 (i_3 - i_1)$

$= 15(8-10)$

$= -30V$

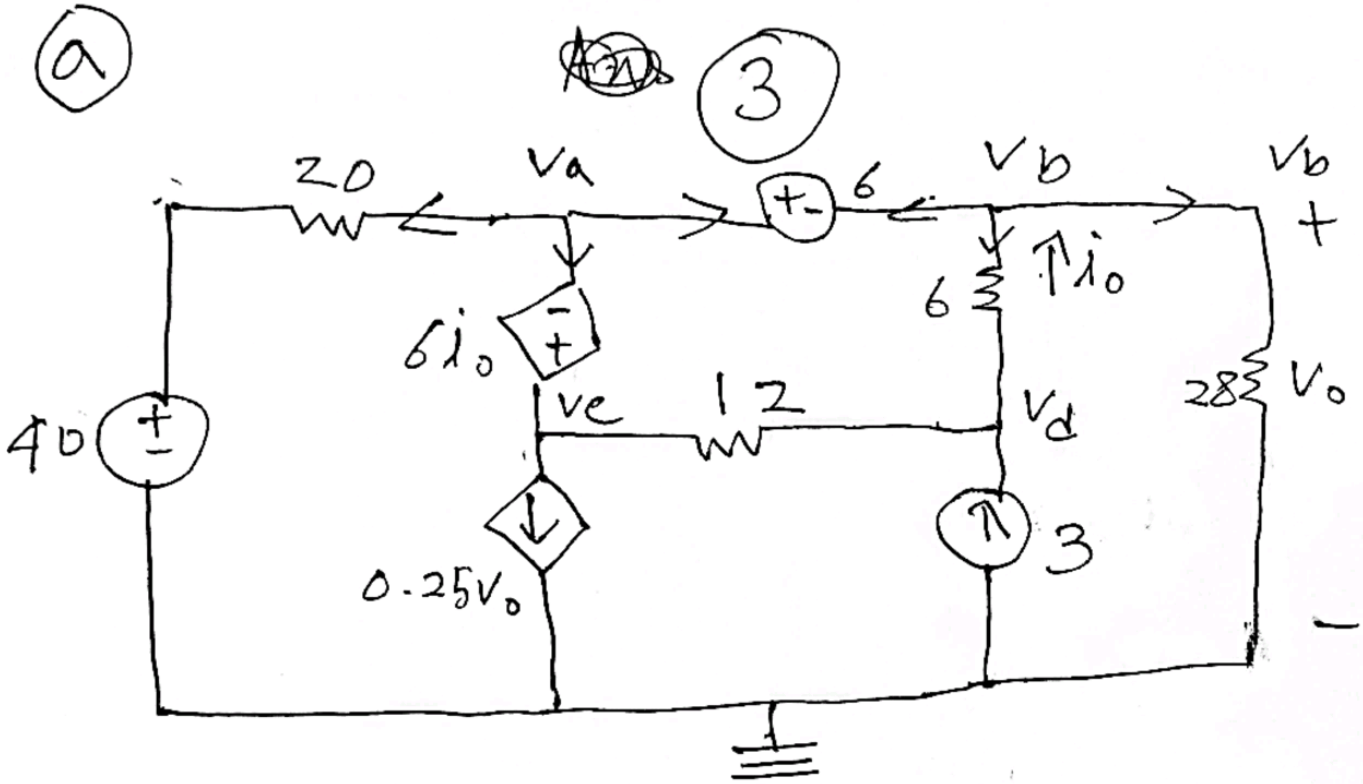
$P = +3V_o \times i_3$

$= -30 \times 8$

$= -240$ mwatt

(supplying the power

(a)



KCL at Va,

$$\frac{V_a - 40}{20} + I_a + I_b = 0$$

KCL at Vb,

$$-I_b + \frac{V_b - V_d}{6} + \frac{V_b}{28} = 0$$

KCL at Vc,

$$0.25V_o - I_a + \frac{V_c - V_d}{12} = 0$$

$V_o = V_b$ 8

Supernode,

$$\frac{V_a}{20} - 2 + \frac{V_b}{6} - \frac{V_d}{6} + \frac{V_b}{28} + 0.25V_o + \frac{V_e}{12} - \frac{V_d}{12} = 0$$

$$\Rightarrow V_a\left(\frac{1}{20}\right) + V_b\left(\frac{1}{6} + \frac{1}{28} + 0.25\right) + V_e\left(\frac{1}{12}\right) + V_d\left(-\frac{1}{6} - \frac{1}{12}\right) = 2 \quad \cdots (I)$$

KCL at V_d,

$$-3 + \frac{V_d - V_e}{12} + \frac{V_d - V_b}{6} = 0$$

$$\Rightarrow -\frac{V_b}{6} - \frac{V_e}{12} + \frac{V_d}{12} + \frac{V_d}{6} = 3 \quad \cdots (II)$$

$$V_a - V_b = 6 \quad \cdots (III)$$

$$V_e - V_a = 6 i_o$$

$$\Rightarrow V_e - V_a - 6 \times \frac{V_d - V_b}{6} = 0$$

$$\Rightarrow -V_a - V_b + V_e - V_d = 0 \quad \cdots (IV)$$

Solving (I), (II), (III) (IV)

$V_a = 19.23V$

$V_b = 13.23V$

$V_c = 79.82V$

$V_d = 47.34V$

(b)

$V_o = V_b$
$= 13.23V$

$I_o = \frac{V_d - V_b}{6}$

$= \frac{47.34 - 13.23}{6}$

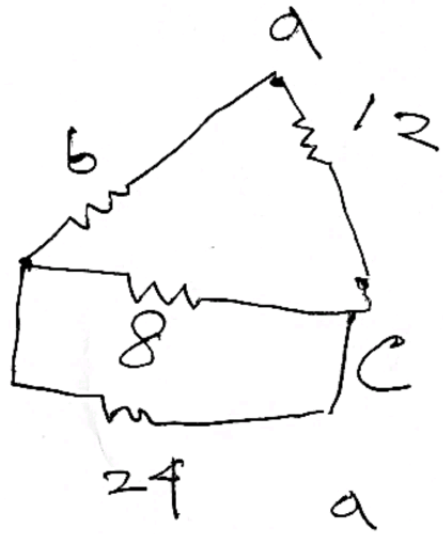
$= 5.685A$

4

a

~~Rac = 12~~

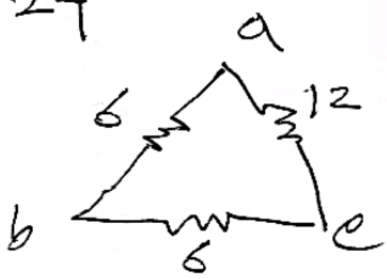
~~Rab~~



$$R_{ac} = 12 \,||\, \{6 + (8 \,||\, 24)\}$$

$$= 12 \,||\, \{6 + 6\}$$

$$= 6 \text{ K}\Omega$$



$$R_{ab} = 6 \,||\, \{12 + (24 \,||\, 8)\}$$

$$= 6 \,||\, 18$$

$$= 4.5 \text{ K}\Omega$$

(b)

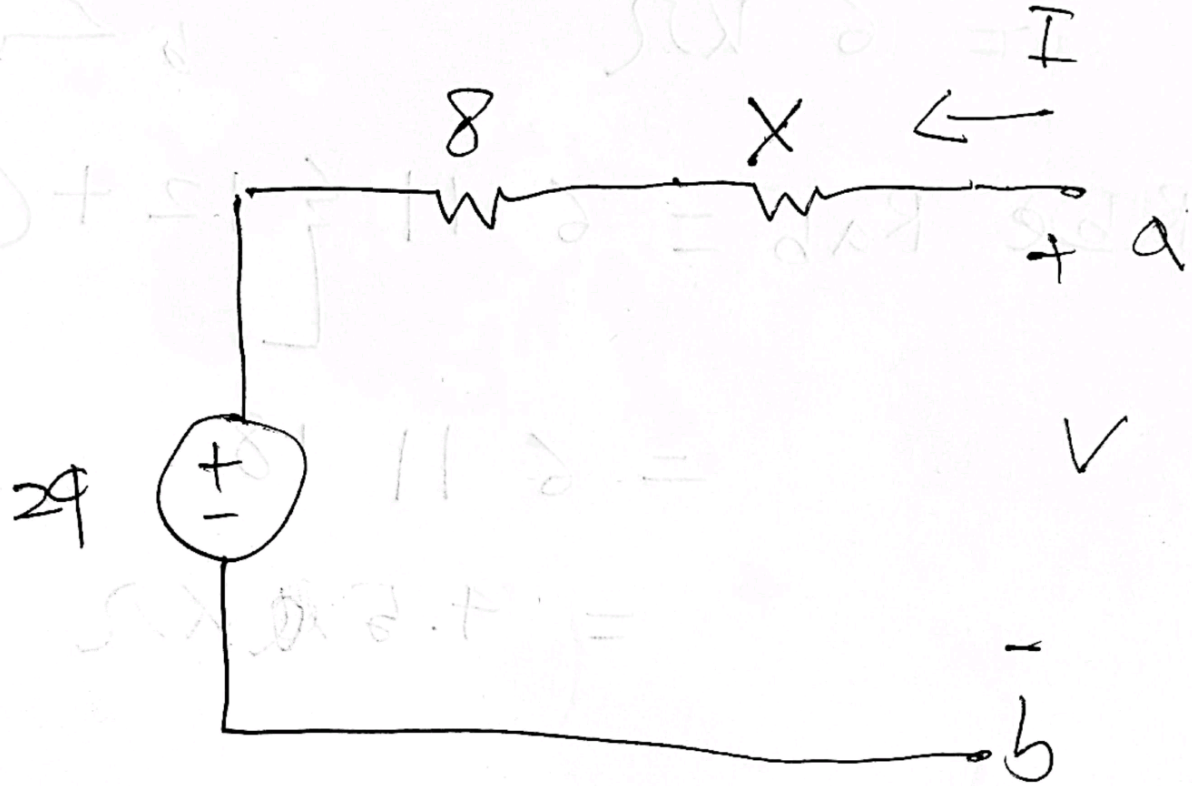
$$4Ix = 4 - 16$$

$$\Rightarrow \quad Ix = \frac{-12}{4}$$

$$= -3A$$

12

(c)



From the graph,

(24, 0), (0, −2)

$$I = \frac{V}{8+X}$$

$$\Rightarrow -2 = \frac{24}{8+X}$$

$$\Rightarrow -16 - 2X = 24$$

$$\Rightarrow -2X = 40$$

$$\Rightarrow X = -20$$