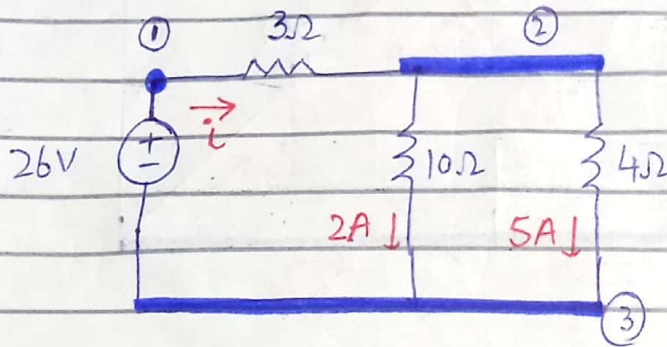


LECTURE #4

④

KCL Problems :-

Problem 1:-



No. of nodes $\Rightarrow 3$

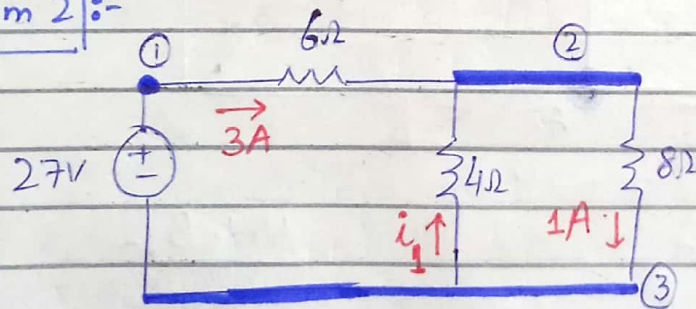
Apply KCL on node 2

Current Entering = Current Leaving

$$i = 2 + 5$$

$$i = 7A$$

Problem 2:-



of Nodes = 3

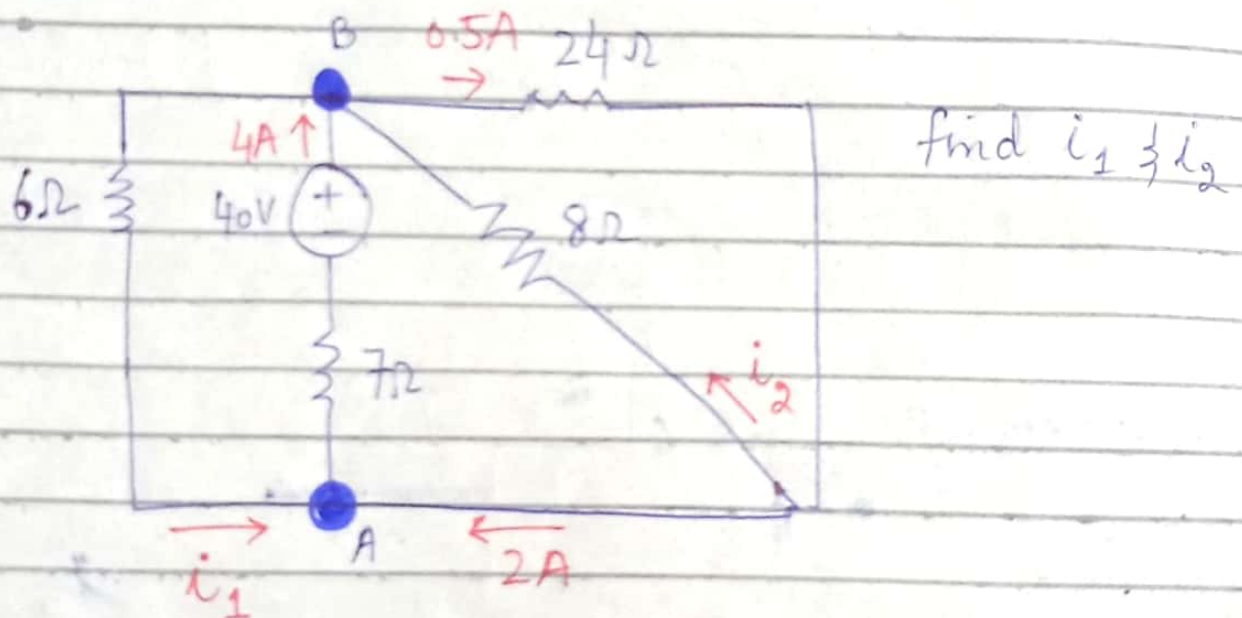
Apply KCL at Node 2 :-

$$3 + i_1 = 1$$

$$i_1 = 1 - 3$$

$$i_1 = -2A$$

Problem 3:-



Node A:-

$$i_1 + 2 = 4$$

$$i_1 = 4 - 2$$

$$\boxed{i_1 = 2A}$$

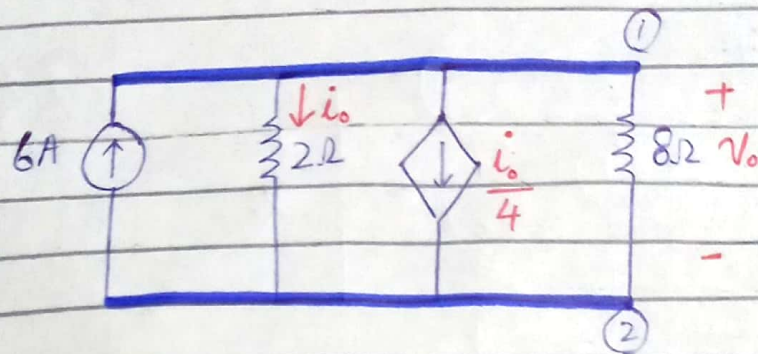
Node B:-

$$4 + i_2 = i_1 + 0.5$$

$$i_2 = 2 + 0.5 - 4$$

$$\boxed{i_2 = -1.5A}$$

Problem 4:- find i_o & v_o



KCL at Node 1

$$6 = i_o + \frac{i_o}{4} + i_{8\Omega}$$

$$V = IR$$

$$6 = i_o \left(1 + \frac{1}{4}\right) + \frac{v_o}{8}$$

$$\text{Define } i_o = \frac{v_o}{2}$$

$$6 = \frac{v_o}{2} \left(\frac{5}{4}\right) + \frac{v_o}{8}$$

$$6 = \frac{6v_o}{8}$$

$$\boxed{v_o = 8V}$$

$$v_o = i_o R$$

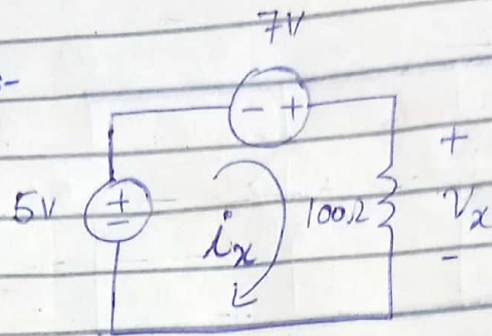
$$\frac{v_o}{2} = i_o$$

$$i_o = \frac{8}{2} = 4A$$

$$\boxed{i_o = 4A}$$

KVL Problems :-

Problem 1 :-



find i_x & V_x

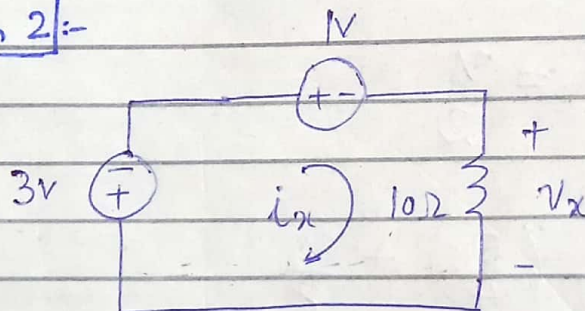
Apply KVL

$$-5 - 7 + V_x = 0$$

$$V_x = 12V$$

$$i_x = \frac{V_x}{100} = \frac{12}{100} = 120mA$$

Problem 2 :-



find i_x & V_x

$$3 + 1 + V_x = 0$$

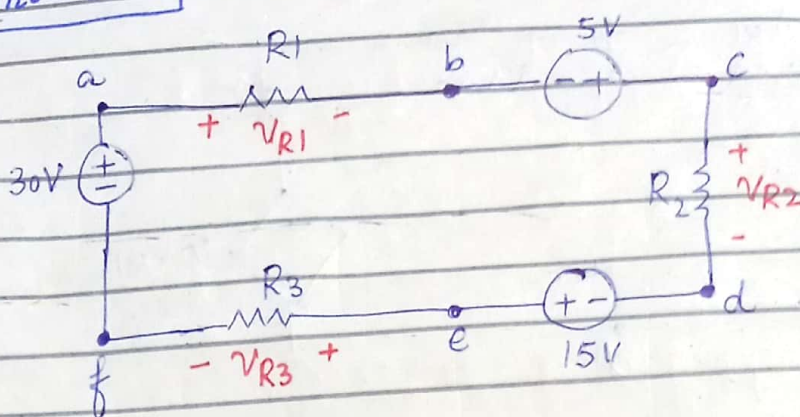
$$V_x = -4V$$

$$V_x = i_x (10)$$

$$\frac{-4}{10} = i_x$$

$$i_x = -400mA$$

Problem 2:- find V_{R3} if $V_{R1} = 18V$
 $V_{R2} = 12V$



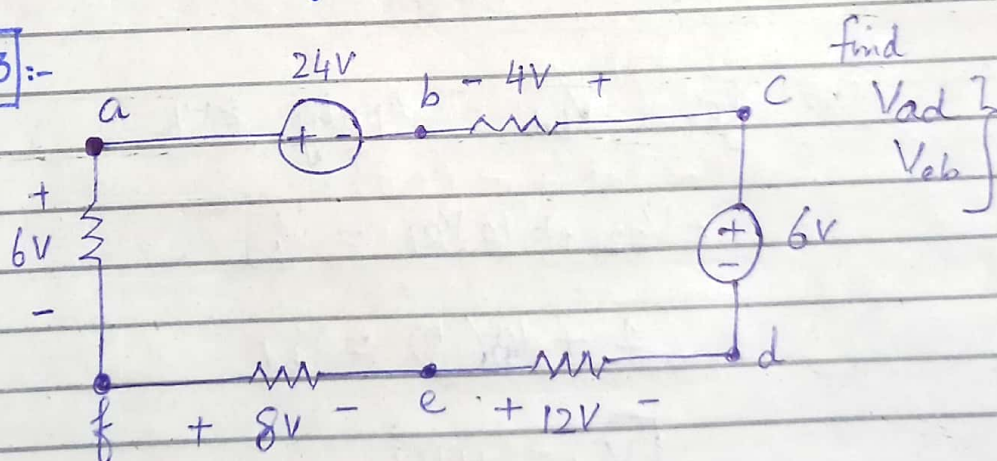
$$-30 + V_{R1} - 5 + V_{R2} - 15 + V_{R3} = 0$$

$$V_{R1} + V_{R2} + V_{R3} = 50$$

$$V_{R3} = 20V$$

* We can apply KVL on paths as well

Problem 3:-



for V_{ad} apply KVL $24 - 4 + 6 = V_{ad}$

$$V_{ad} = 26V$$

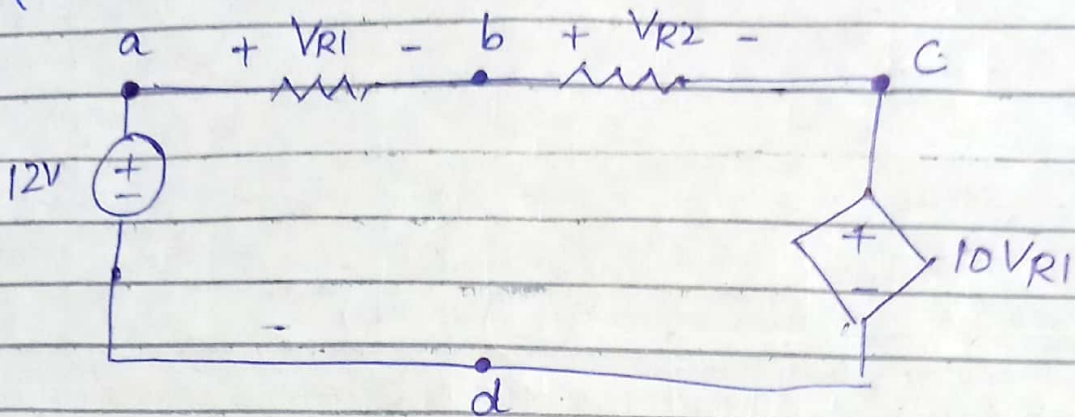
for V_{eb}

$$-8 - 6 + 24 = V_{eb}$$

$$V_{eb} = 10V$$

(6)

Problem 4:- find V_{bd} if $V_{R2} = 1V$



For V_{R1} Apply KVL on outer loop

$$-12 + V_{R1} + V_{R2} + 10V_{R1} = 0$$

$$11V_{R1} - 12 + 1 = 0$$

$$V_{R1} = \frac{11}{11} = 1V$$

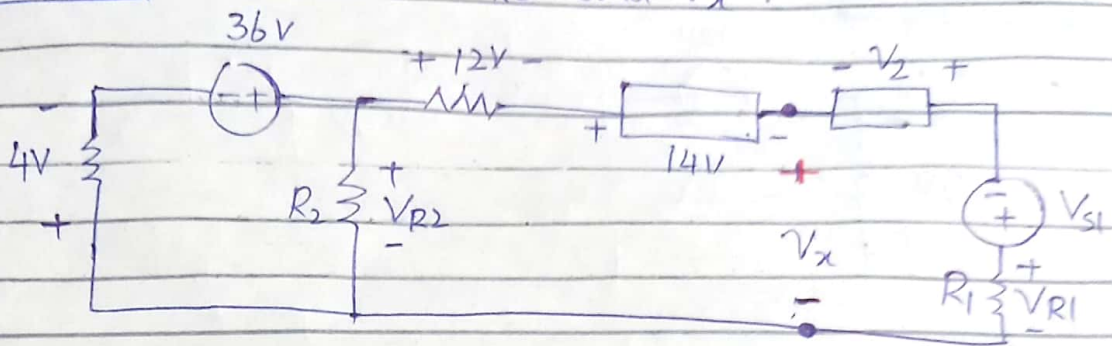
Now for V_{bd} , Apply KVL

$$+V_{R2} + 10V_{R1} = V_{bd}$$

$$1 + 10(1) = V_{bd}$$

$$\boxed{V_{bd} = 11V}$$

(7)

Problem 5:-find V_{R2} and V_x .

$$+4 - 36 + V_{R2} = 0$$

$$V_{R2} = 36 - 4 = 32V$$

$$-V_x - 14 - 12 + 36 - 4 = 0$$

entering
signs

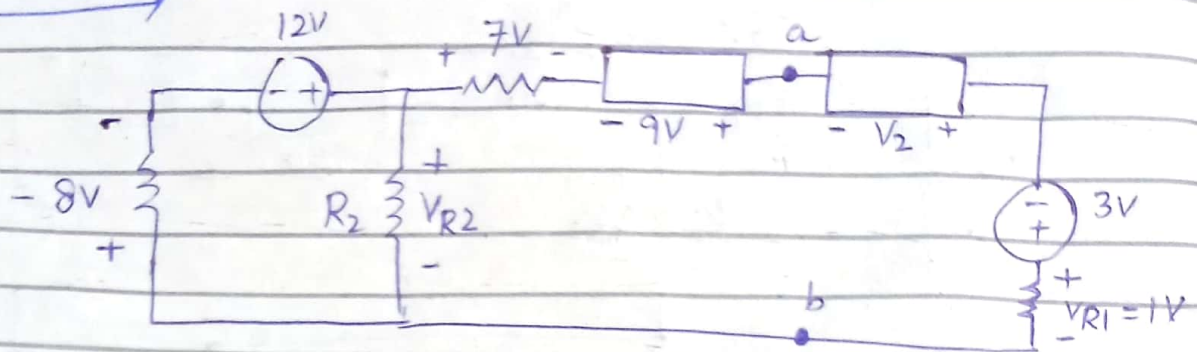
~~$$-V_x - 14 - 12 + 36 - 4 = 0$$~~

$$-14 - 12 + 36 - 4 = V_x$$

$$V_x = +36 - 30 = 6V$$

$$\boxed{V_x = 6V}$$

(8)

Problem 6:- $V_{R2} = ? \quad V_2 = ? \text{ if } V_{R1} = 1V$ For V_{R2} , apply KVL on Loop

$$+(-8) - 12 + V_{R2} = 0$$

$$V_{R2} = 12 + 8$$

$$\boxed{V_{R2} = 20V}$$

For V_2 ,

$$-V_2 - 3 + V_{R1} = V_{ab} \quad \text{--- (1)}$$

Now for V_{ab} :-

$$+9 - 7 + 12 - (-8) = V_{ab}$$

$$9 - 7 + 12 + 8 = V_{ab}$$

$$V_{ab} = 2 + 20$$

$$V_{ab} = 22V$$

put in eq. (1) $-3 + 1 - 22 = V_2$

$$V_2 = -25 + 1$$

$$\boxed{V_2 = -24V}$$