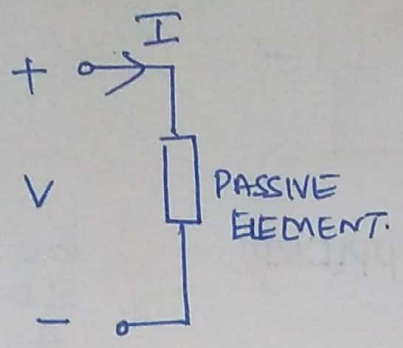
BASIC ELECTRICAL ENGINEERING.

LECTURE #3

SIGN CONVENTIONS

(1)



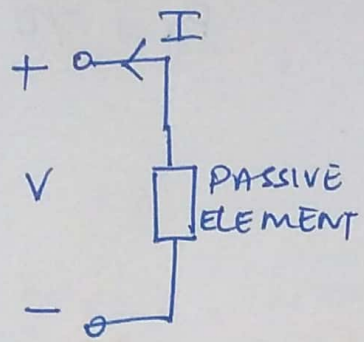
PASSIVE SIGN CONVENTION.

$V = IR$.

$P = VI$ ALWAYS (+ve) ABSORBED

CURRENT ENTERS THE POSITIVE TERMINAL

(2)



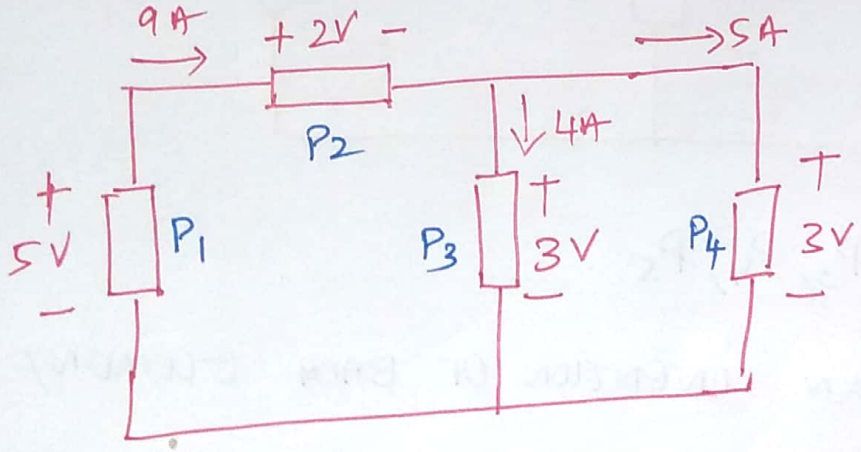
ACTIVE SIGN CONVENTION

$V = -IR$.

$P = VI$ ALWAYS (+VE SUPPLIED.

CURRENT LEAVES THE POSITIVE TERMINAL

POWER IN A CIRCUIT.



$P_1 = 45$ W SUPPLIED

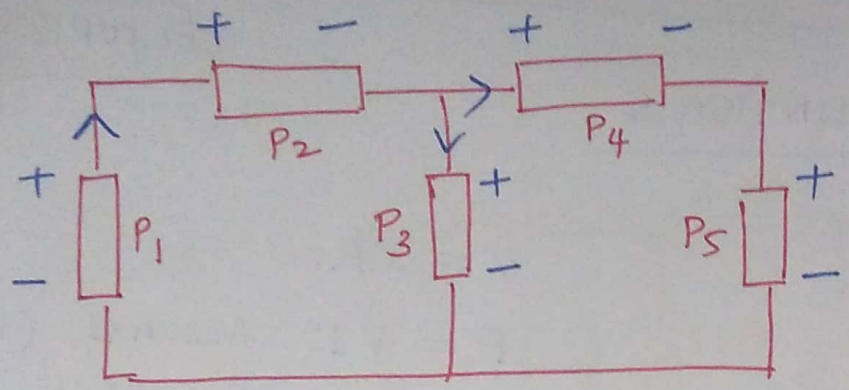
$P_2 = 18$ W ABSORBED

$P_3 = 12$ W ABSORBED

$P_4 = 15$ W ABSORBED

$\sum$ POWER SUPPLIED = $\sum$ POWER ABSORBED

(2)



If $P_1 = -205\ W$ (SUPPLIED)

$P_2 = 60\ W$

$P_5 = 30\ W$

$P_4 = 45\ W$

} ABSORBED

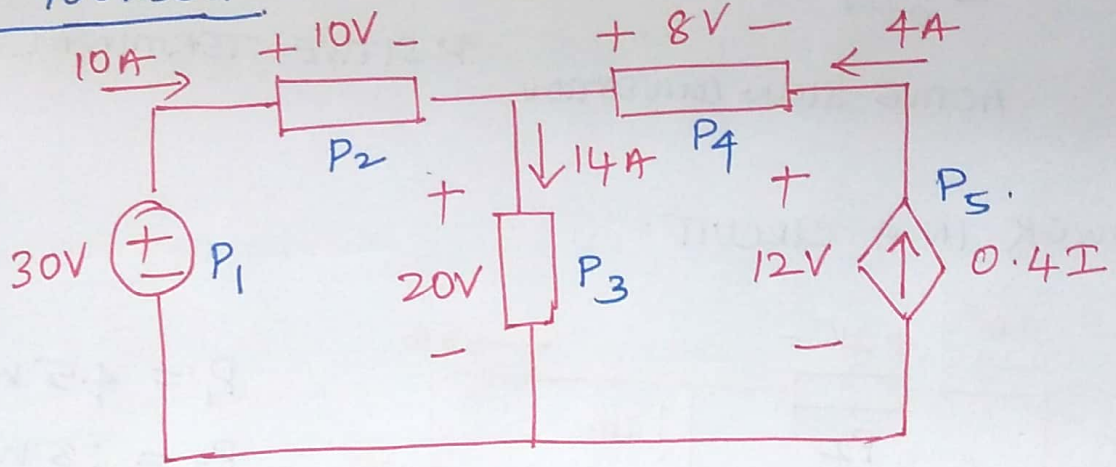
$P_3 = ?$

$P_3 = 70\ W$.

$$\begin{array}{r} 60 \\ +\ 30 \\ 45 \\ \hline 135 \end{array}$$

$P_3 = 70$

DO IT YOURSELF



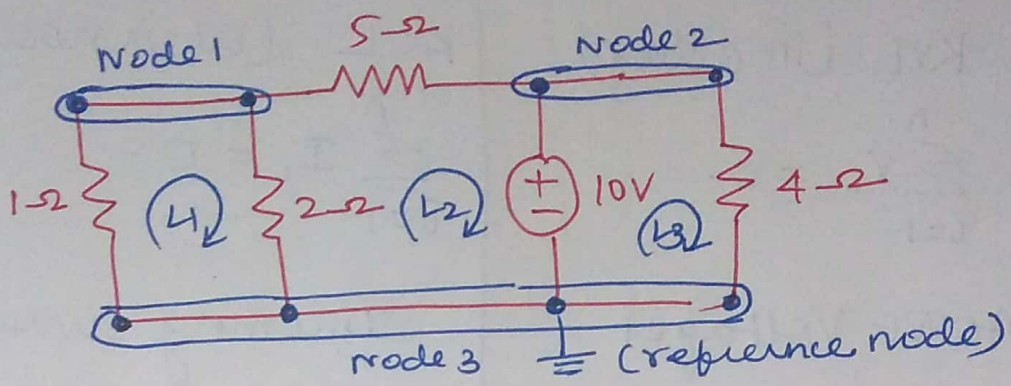
Find P_1, P_2, P_3, P_4, P_5.

SPECIFY SIGN CONVENTION OF EACH ELEMENT

AND SAY IF POWER SUPPLIED / ABSORBED

ELEMENT	SIGN CONV.	POWER SUPPLIED	POWER ABSORBED.

IDENTIFY THE NODES, BRANCHES, LOOPS.



Nodes = 3

Branches = 5

loops = 3.

$b = l + n - 1$

$l = b - n + 1$

$= 5 - 3 + 1$

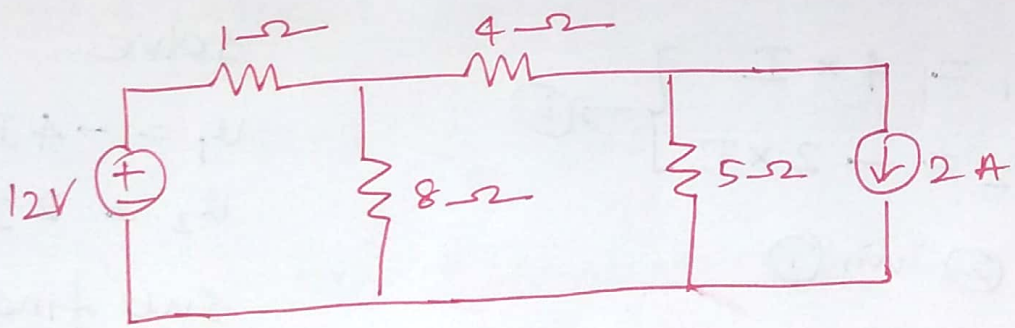
$l = 3$ (independent loops)

SERIES : NONE

PARALLEL : 1Ω, 2Ω

4Ω, 10V source.

DO IT YOURSELF



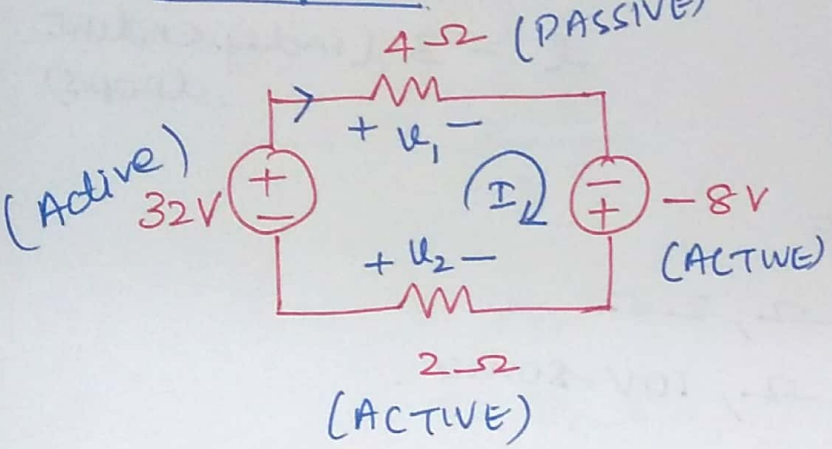
Determine the number of nodes, branches, independent loops, branches in series and branches in parallel.

(4)

KIRCHOFF'S LAWS.

KVL (in a loop)	KCL (at a node)
$\sum_{i=1}^{n} V_i = 0$.	$\sum_{i=1}^{n} I_i = 0$.
ACTIVE Voltages = Passive Voltage	Incoming currents = outgoing currents.

Example



$\therefore 32 + V_2 - 8 = V_1 \rightarrow (1)$

$v_1 = 4 \times I$

$v_2 = -2 \times I$ $\rightarrow (2)$

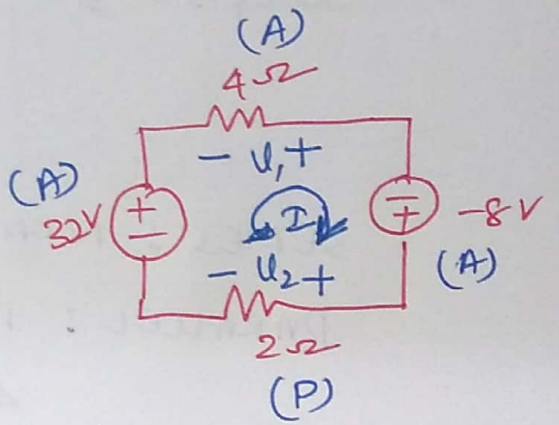
Sub (2) in (1)

$24 = V_1 - v_2 = 4I + 2I.$

$\therefore I = 24/6 = 4A$

$V_1 = 16V$

$V_2 = -8V.$



$\therefore$ ~~$32 + v_1 - 8 = v_2$~~

$32 + v_1 - 8 = v_2$

solve

$v_1 = -4I$

$v_2 = 2I.$

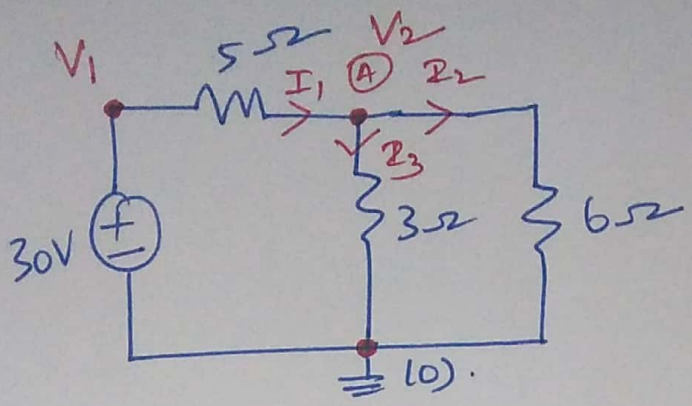
sub find.

v_1

v_2

$I.$

Same solution.

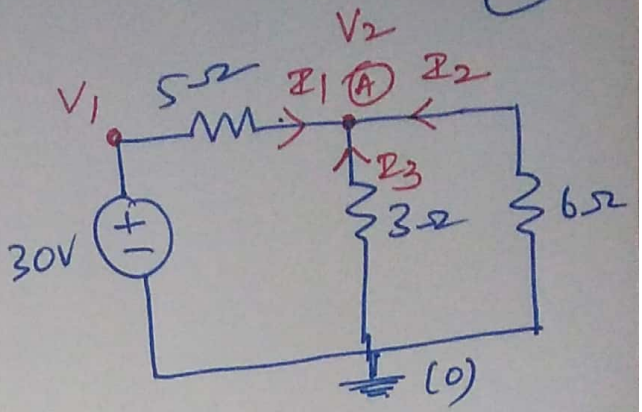


At node A, $I_1 = I_2 + I_3$. (KCL)

$$I_1 = \frac{V_1 - V_2}{5}$$

$$I_2 = \frac{V_2 - 0}{6}$$

$$I_3 = \frac{V_2 - 0}{3}$$



At node (A),

$$I_1 + I_2 + I_3 = 0.$$

$$I_1 = \frac{V_1 - V_2}{5}$$

$$I_2 = \frac{0 - V_2}{6}$$

$$I_3 = \frac{0 - V_2}{3}$$

Find $V_1, V_2,$

I_1, I_2, I_3.

Note: Node 1 voltage $V_1 = 30V$ (known).

Find V_2 and

Branch currents I_1, I_2, I_3.

For both cases.