Sol: 01:

. Select the bottom node to be ground.

$$4 = 2V_x + \frac{V}{12} + \frac{V}{6}$$

$$V_x = \frac{4}{6}V$$

$$\Rightarrow V = \frac{48}{19}$$

Sol: 02:

Select the bottom node to be ground and define the top node as V:

$$12 + 2I_0 = \frac{V}{12} + \frac{V}{6} + \frac{V}{4}$$

$$I_0 = \frac{V}{6}$$

$$\Rightarrow V = 72$$

Sol: 03:

Select the bottom node to be ground. Define the node voltages, V_0, V_1, and V_2 across the top from left to right. Then:

$$V_1 - V_2 = 4I_0$$

$$4 = \frac{V_1}{2} + \frac{V_1}{2} + \frac{V_2}{4}$$

$$I_0 = \frac{V_1}{2}$$

$V_0 = 8/3$

Sol: 04:

Select the bottom node to be ground. Define the node voltages, V_1, V_2, and V_3 across the top from left to right. Then:

$V_1 = 12$

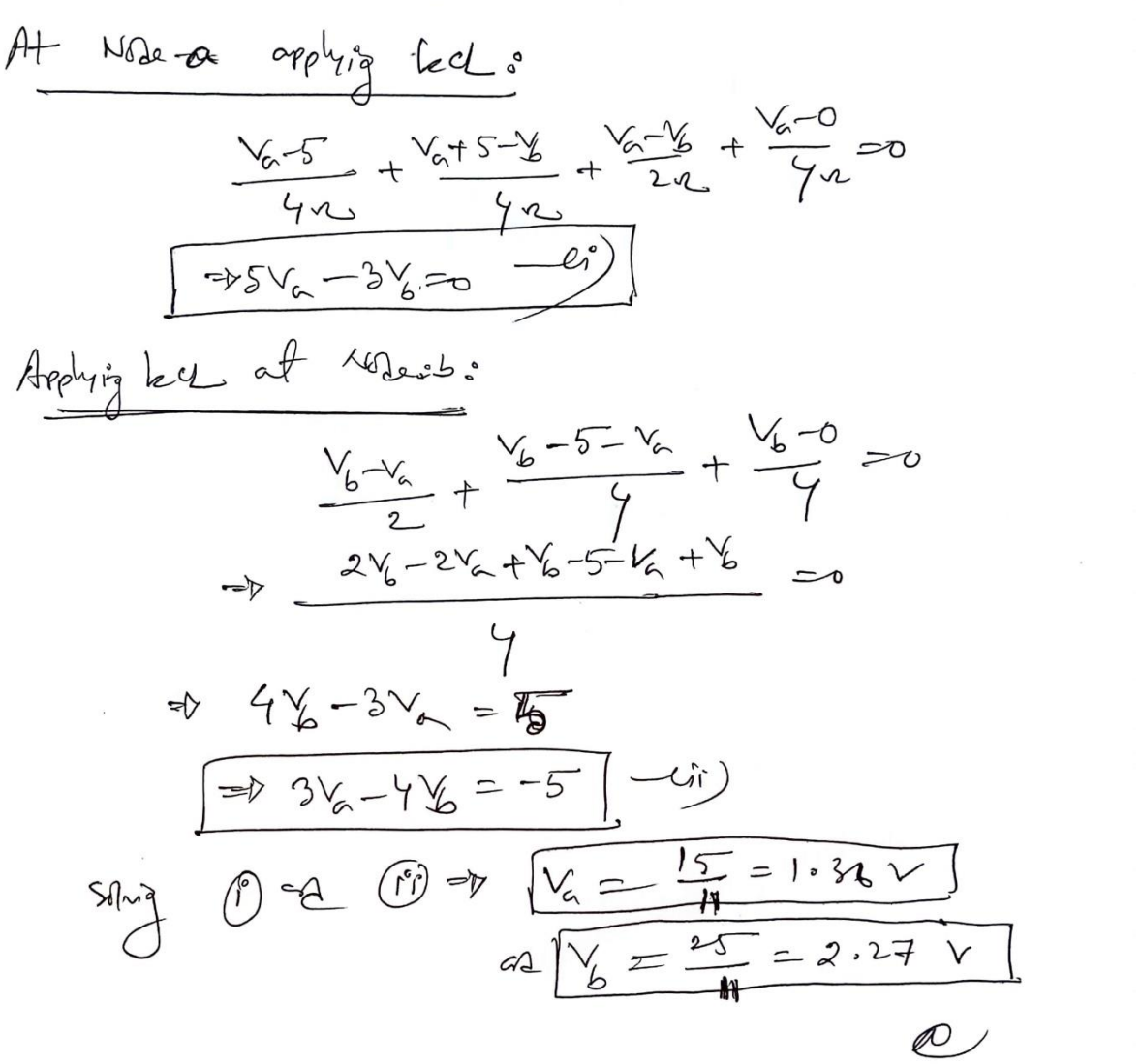
$V_2 - V_3 = 2V_a$

$$0 = \frac{V_2 - V_1}{2} + \frac{V_2}{4} + \frac{V_3}{6}$$

$V_a = V_1 - V_2$

$\Rightarrow V_0 = V_3 = 0$

Sol: 05:



Sol: 06:

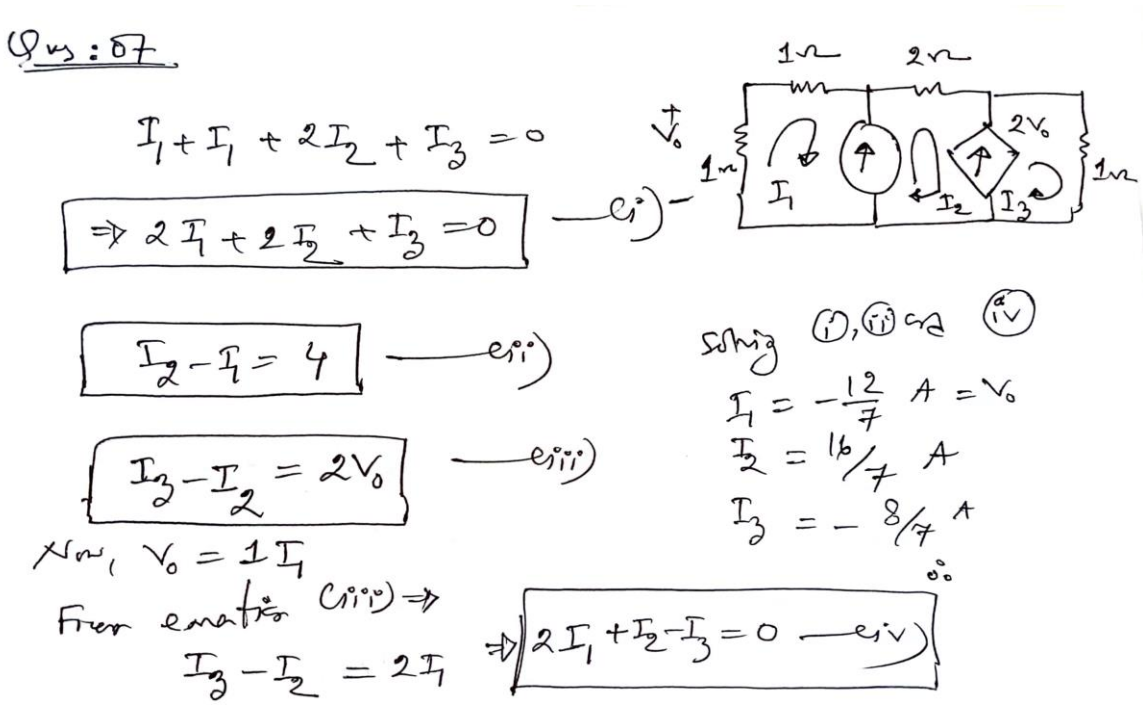
Define the mesh current I_1 going counter clockwise around the right loop and I2 going clockwise around the left loop. Then:

$I_1 = 2$

$-12 + 4(I_2 + I_1) + 6 + 2I_2 = 0$

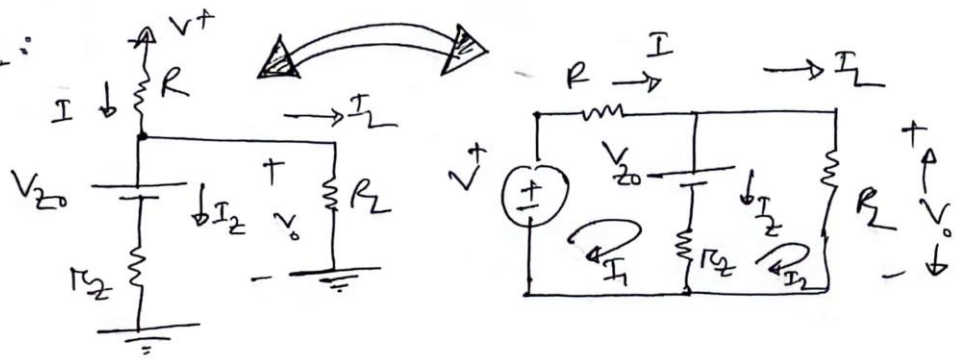
$\Rightarrow I_2 = -\frac{1}{3}, V_0 = -2I_2 = \frac{2}{3}$

Sol: 07:



Sol: 08:

Ques: 08:



$R = 100\,\Omega$, $R_L = 10\,k\Omega$, $r_Z = 20\,\Omega$, $V_{Z0} = 3V$ & $I_Z = 1\,mA$

At loop 1: $RI_1 + V_{Z0} + r_Z I_Z - V^+ = 0$

$\Rightarrow 100 \times I + 3 + (20 \times 1 \times 10^{-3}) = V^+$ —(i)

Again, $I_1 - I_2 = I_Z$

$\Rightarrow I - I_L = 1\,mA$ —(ii)

At loop 2: $I_L R_L - r_Z I_Z - V_{Z0} = 0$

$\Rightarrow 10 \times 10^3 I_L - (20 \times 10^{-3}) = 3$ —(iii)

$\Rightarrow I_L = \dfrac{3 + 20 \times 10^{-3}}{10 \times 10^3} = 302\,\mu A$

$= 0.302\,mA$

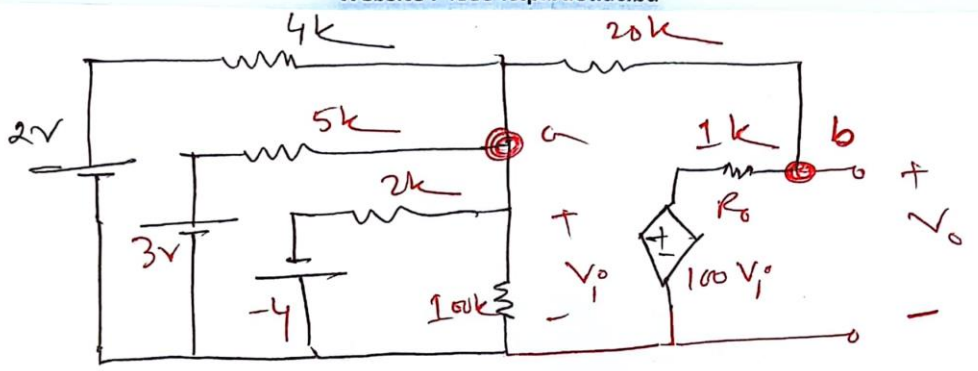
$\therefore I_L = 0.302\,mA$

from (ii), $I = (1 \times 10^{-3}) + I_L = (10^{-3}) + (0.302 \times 10^{-3})$

$I = 1.302\,mA$

from (i), $V^+ = 3.15\,V$ & $V_0 = R_L I_L = 3.02\,V$

Sol: 09:



At node a:

$$\frac{V_a-2}{4}+\frac{V_a-3}{5}+\frac{V_a+4}{2}+\frac{V_a}{100}+\frac{V_a-V_b}{20}=0 \quad \longrightarrow (i)$$

At node b:

$$\frac{V_b-V_a}{20}+\frac{V_b-100V_i^o}{1}=0$$

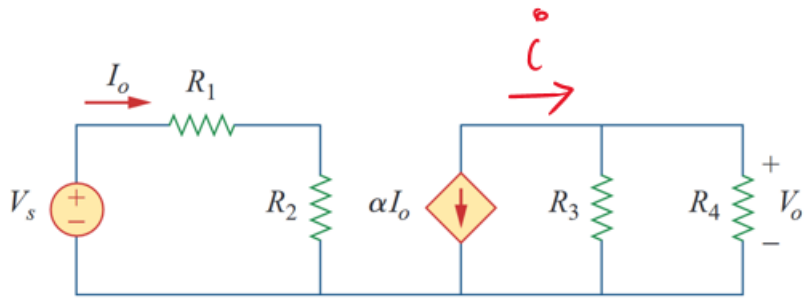
$$\Rightarrow \frac{V_b-V_a}{20}+\frac{V_b-100V_a}{1}=0 \quad \longrightarrow (ii)$$

Solve (i) and (ii) $\Rightarrow$

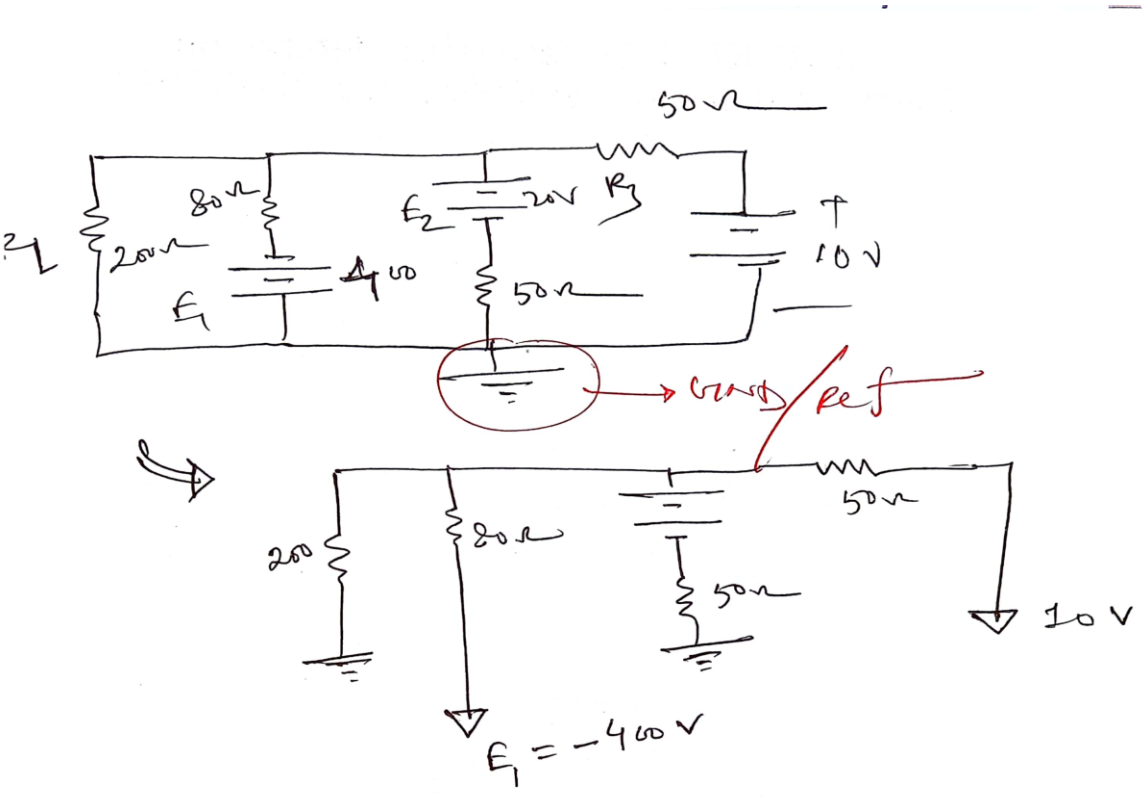
$V_a =$ Calculate

$V_b =$ Calculate

Sol: 10:

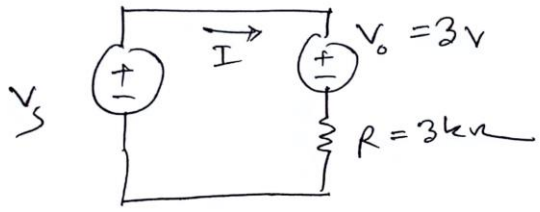

I_o
R_1
V_s
R_2
αI_o
R_3
R_4
V_o

Sol: 11:

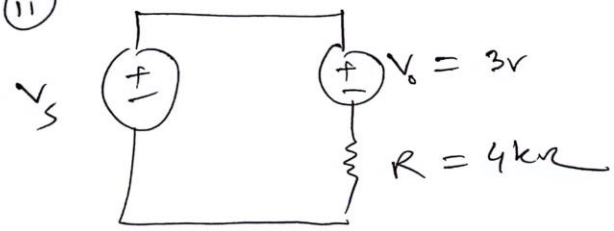

50Ω
80Ω
20Ω
E_2
20V
R_3
E_1
400
50Ω
10 V
Gnd/Ref
80Ω
50Ω
50Ω
10 V
$E_1 = -400$ V

Sol: 12:

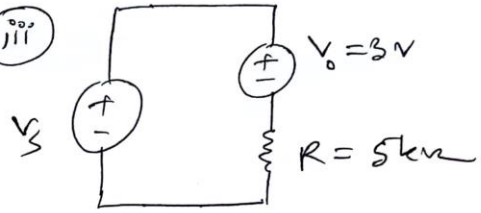
Question 12 : (i) $V_o = 3V$ and $R = 3\ [1/R = m]$



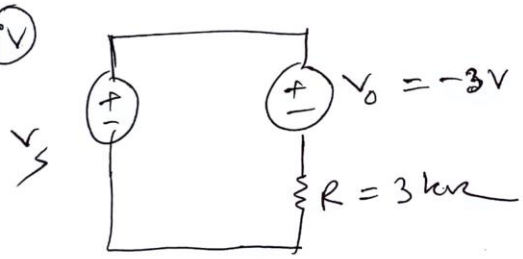
(ii)



(iii)



(iv)



(v)