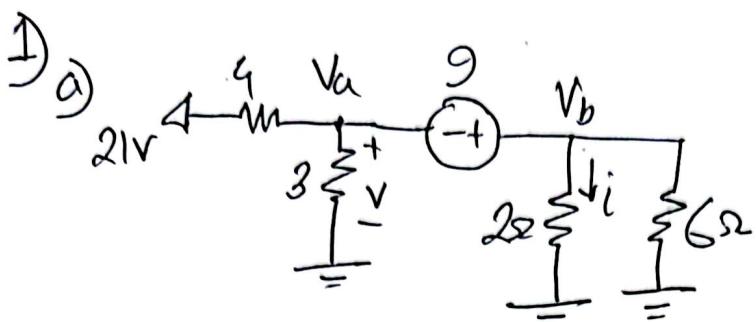


CSE251 Assignment [Solution]



b) KCL at Super Node

$$\frac{V_a - 21}{4} + \frac{V_a}{3} + \frac{V_b}{2} + \frac{V_b}{6}$$

$$\Rightarrow 7V_a + 8V_b = 63 \quad \text{--- (i)}$$

$$V_a - V_b = -9 \quad \text{--- (ii)}$$

Solving eqn (i) & (ii)

$$V_a = -0.6V \quad V_b = 8.4V$$

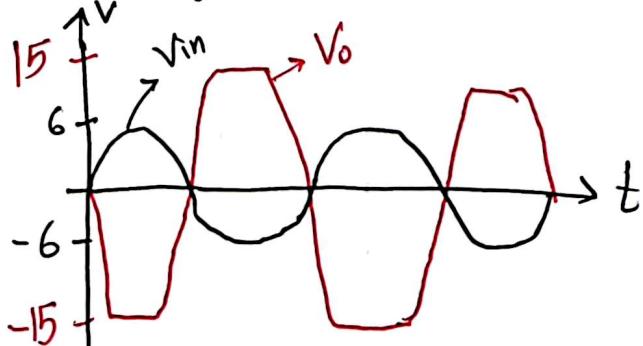
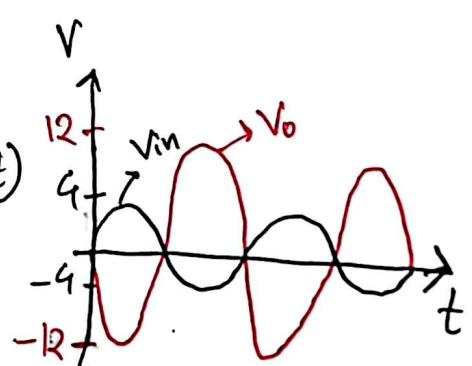
$$\therefore \boxed{\begin{aligned} V &= -0.6V \\ i &= 4.2A \end{aligned}} \quad i = \frac{V_b - 0}{2} = \frac{8.4}{2} = 4.2A$$

2)

a) $V_o = -\frac{6}{2} \times 4 = \boxed{-12V}$

b) $V_o = -\frac{6}{2} (4 \sin(\omega t)) = -12 \sin(\omega t)$

c) $V_o = -\frac{6}{2} \{6 \sin(\omega t)\} = -18 \sin(\omega t)$



1 C)

Extra

-find in

$$i_1 = \frac{24 - (-8)}{9} \\ = 8A$$

REL at a

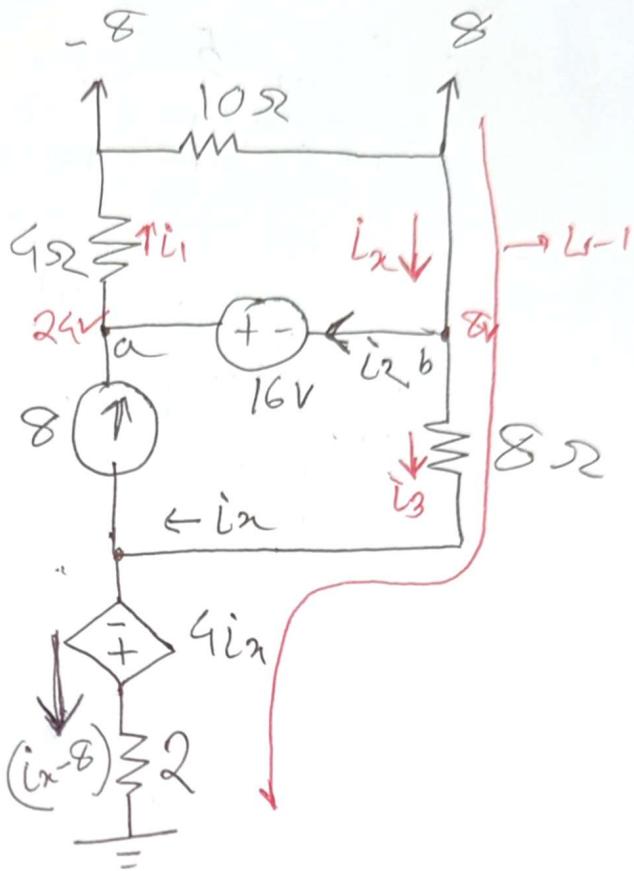
$$8 + i_2 = \hat{i}_1$$

$$\Rightarrow i_2 = OA$$

KCL at Node b

$$i_n = i_2 + i_3$$

$$\Rightarrow l_n = l_3$$



KVL at L-1

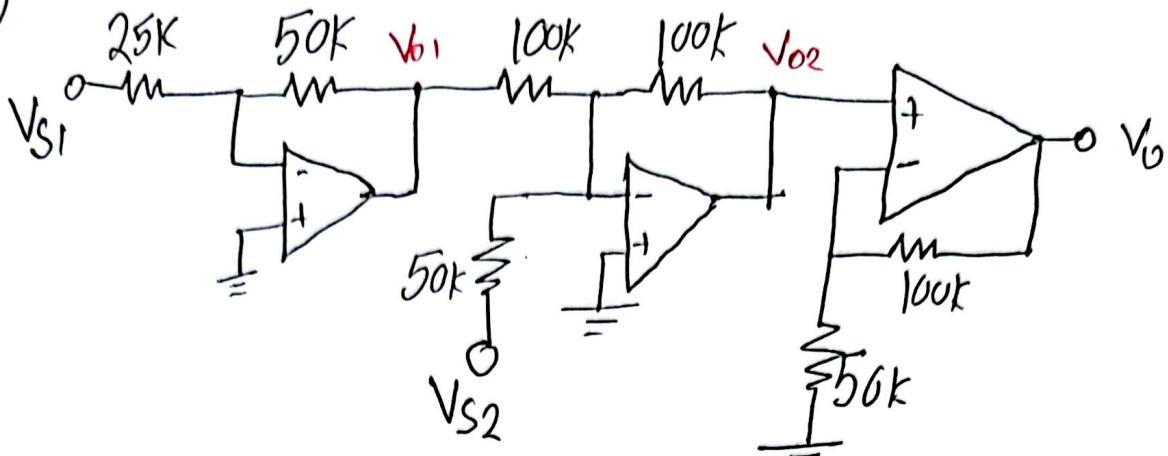
$$8 = 8\sin - 4\sin + 2(\sin - 8)$$

$$\Rightarrow 8 = 8\sin - 4\sin + 2\sin - 16$$

$$\Rightarrow \sin = 24$$

$$\Rightarrow \ln = 4A$$

3)



$$V_{O1} = -\frac{50}{25} V_{S1} = -2 V_{S1}$$

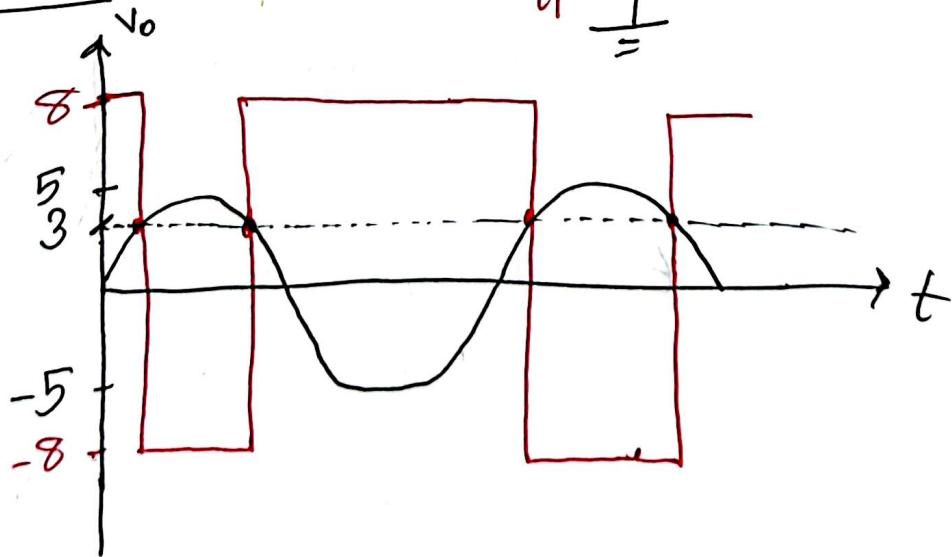
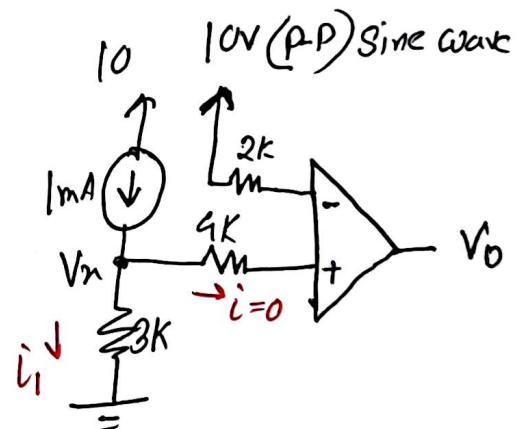
$$\begin{aligned} V_{O2} &= -\frac{100}{100} V_{O1} - \frac{100}{50} V_{S2} \\ &= 2 V_{S1} - 2 V_{S2} \end{aligned}$$

$$\begin{aligned} V_0 &= \left(1 + \frac{100}{50}\right) V_{O2} = 3 (2 V_{S1} - 2 V_{S2}) \\ \boxed{V_0} &= 6 V_{S1} - 6 V_{S2} \end{aligned}$$

4) KCL at Node V_x

$$\begin{aligned} I &= i_1 \\ \Rightarrow I &= \frac{V_x - 0}{3} \end{aligned}$$

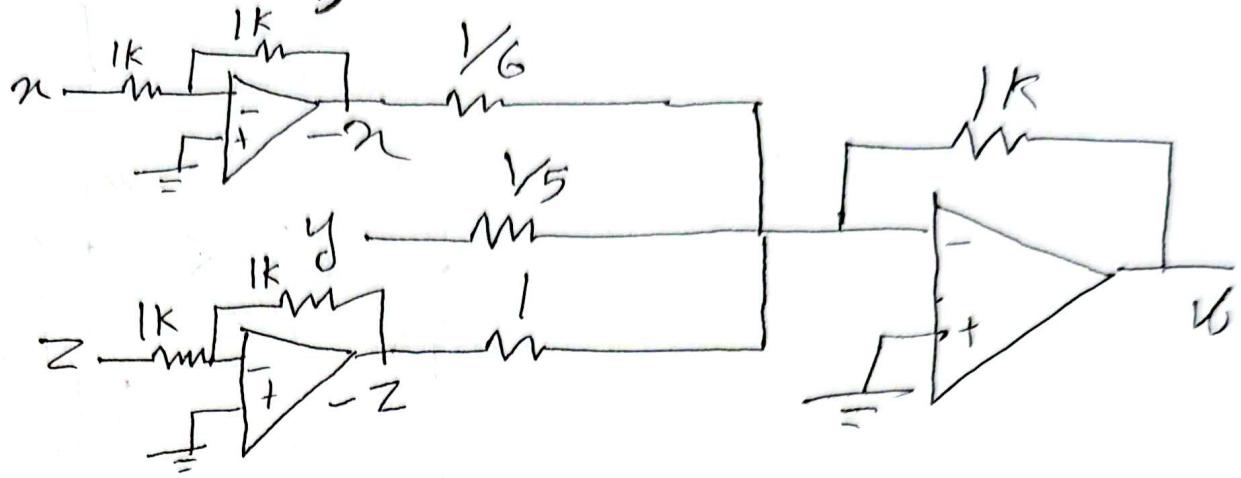
$$\therefore \boxed{V_x = 3V}$$



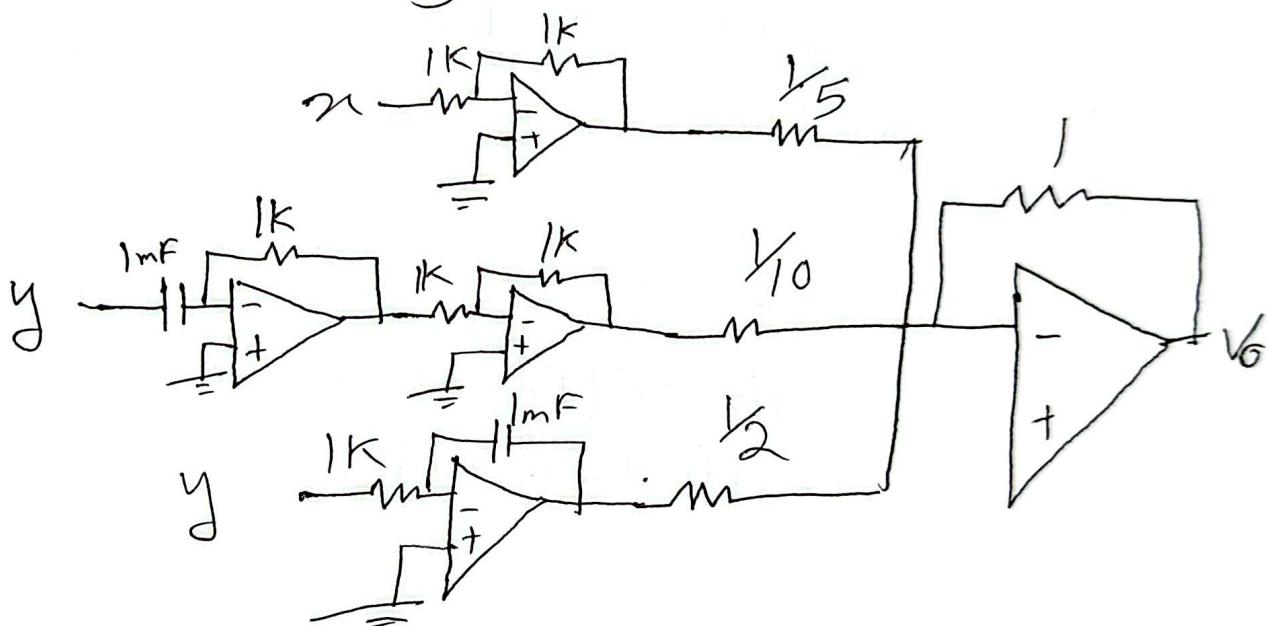
(85)

a) $f = 6x - 5y + z$

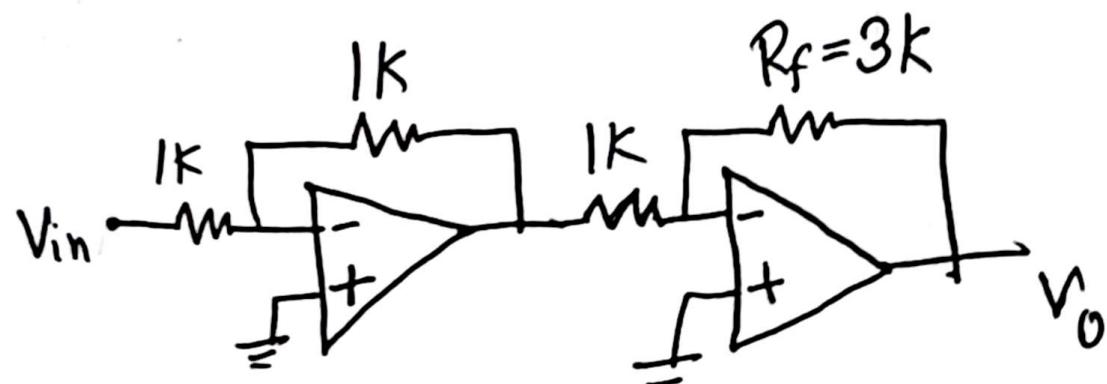
$$= \frac{1}{6}x - \frac{1}{5}y + z$$



b) $f = 5x - 10 \frac{dy}{dt} + 2 \int z dt$



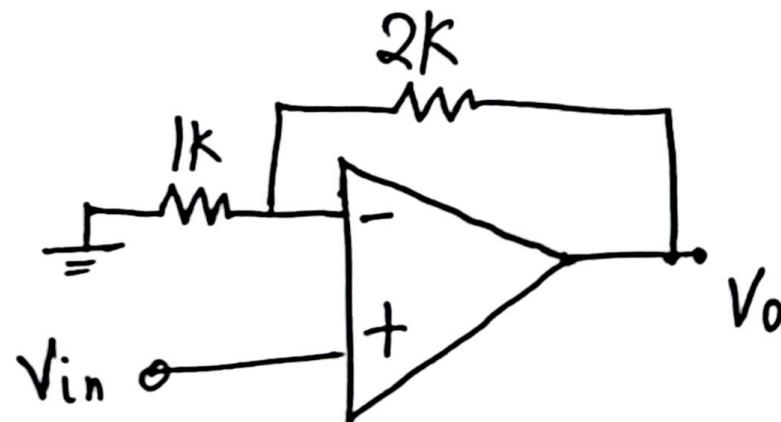
7) a) $\text{gain} = \frac{15}{5} = 3$



b) $\text{gain} = \frac{15}{5} = 3$

$$\left(1 + \frac{R_f}{R_1}\right) = 3$$

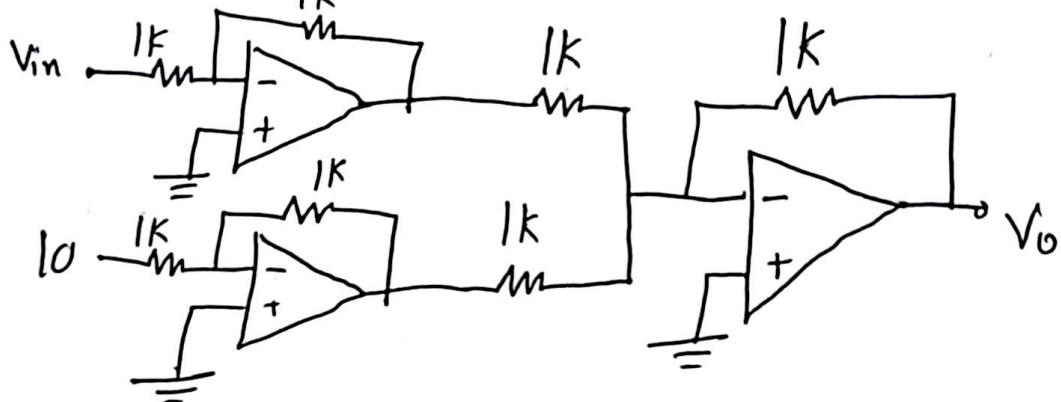
$$\Rightarrow \frac{R_f}{R_1} = 2$$



8)

V_{in} is shifted by 10V

$$\begin{aligned} V_0 &= 5 \sin(t) + 10 \\ &= -\{-5 \sin(t)\} - \{-10\} \end{aligned}$$



6)

$$\frac{V_i - 3}{3-1} = \frac{V_o - 9}{9-3}$$

$$\Rightarrow V_{in} - 3 = \frac{V_o - 9}{3}$$

$$\Rightarrow 3V_{in} - 9 = V_o - 9$$

$$\Rightarrow V_o = 3V_{in}; \text{ gain} = 3$$

Non inverting Amplifier

$$\left(1 + \frac{R_f}{R_i}\right) = 3$$

$$\Rightarrow \frac{R_f}{R_i} = 2$$

$$R_f = 2k$$

$$R_i = 1k$$

$$\boxed{\begin{aligned} V_S^+ &= 9V \\ V_S^- &= 3V \end{aligned}}$$

