

Solution of Tut Sheet 2

Sol 1

To find the max^m possible value of O/P offset vol., reduce the I/P vol. to zero.

Closed loop gain of the amp^r

$$A = 1 + \frac{R_F}{R_1}$$
$$= 1 + \frac{10k}{1k} = 11$$

As $V_{io} = 10 \text{ mV dc}$ max^m

$$V_{oo} = A V_{io}$$
$$= 11 (10 \text{ mV})$$
$$= 110 \text{ mV dc}$$

⇒ O/P terminal can be either at a negative or a positive 110 mV dc with respect to ground even though $V_{in} = 0 \text{ V}$.

Sol. 2

$$V_1 = \frac{V_a + V_b + V_c}{3} \quad (\text{Average of I/Ps})$$
$$= \frac{2 - 3 + 4}{3}$$
$$= 1 \text{ V}$$

$$V_o = \left(1 + \frac{R_F}{R_1} \right) \frac{1}{3} (V_a + V_b + V_c)$$
$$= \left(1 + \frac{2k}{1k} \right) 1$$
$$= 3 \text{ V}$$

Sol 3 Let vol. at non inverting terminal is V_N

Apply KCL at Pin (3) & find value of V_N

$$\frac{V_1 - V_N}{R_1} + \frac{0 - V_N}{R_2} = 0$$

$$\frac{V_1}{R_1} = \frac{V_N}{R_1} + \frac{V_N}{R_2}$$

$$\frac{V_1}{R_1} = \left(\frac{1}{R_1} + \frac{1}{R_2} \right) V_N$$

$$\frac{V_1}{R_1} = \left(\frac{R_1 + R_2}{R_1 R_2} \right) V_N$$

$$V_N = \left(\frac{R_2}{R_1 + R_2} \right) V_1$$

1) O/P vol. $V_o = \underbrace{-\frac{R'}{R} V_2}_{\text{Due to inverting I/P}} + \underbrace{\left(1 + \frac{R'}{R} \right) V_N}_{\text{Due to non inverting I/P}}$

$$= -\frac{R'}{R} V_2 + \left(1 + \frac{R'}{R} \right) \left(\frac{R_2}{R_1 + R_2} \right) V_1$$

2) $V_{cm} = \frac{1}{2} (V_1 + V_2)$

$$V_d = V_1 - V_2$$

$$\therefore V_1 = V_{cm} + \frac{V_d}{2}$$

$$\& V_2 = V_{cm} - \frac{V_d}{2}$$

Put these values in above eqⁿ of V_o

