Problems :

1.) Find the gain of a non-inverting amplifier if $R_f = 10k\Omega$ and $R_1 = 1k\Omega$

Given: $R_f = 10k\Omega$

$R_1 = 1k\Omega$

W.k.t the output of a non-inverting amplifier. is

$$V_o = \left(1 + \frac{R_f}{R_1}\right) V_{in}$$

Here Gain is $A = 1 + \frac{R_f}{R_1}$ $\left[\frac{V_o}{V_{in}} = A\right]$

$$A = 1 + \frac{10}{1}$$

$$\boxed{A = 11}$$

2.) A non-inverting amplifier has closed loop gain of 25. If input voltage $V_i = 10mV$, $R_f = 10k\Omega$ determine the value of R_1 and output voltage V_o

Given : The closed loop gain $A = 25$

$V_i = 10mV$, $R_f = 10k\Omega$

W.k.t, for a non-inverting amplifier.

Gain $A = 1 + \frac{R_f}{R_1}$

Given $A = 25$

P.T.O

Problem 2 continued....

Hence

$$1 + \frac{R_f}{R_1} = 25$$

$$\frac{R_f}{R_1} = 25 - 1 = 24$$

Hence.

$$R_1 = \frac{R_f}{24} = \frac{10\,k\Omega}{24} = 416.67\,\Omega$$

The output voltage V_o

$$V_o = V_{in}\left(1 + \frac{R_f}{R_1}\right)$$

$$= 10\,mV \times 25$$

$$V_o = 250\,mV$$

3) Design an inverting and non-inverting operational amplifier to have a gain of 15.

Given: $A = 15$

For an inverting amplifier $V_o = -\frac{R_f}{R_1} V_{in}$

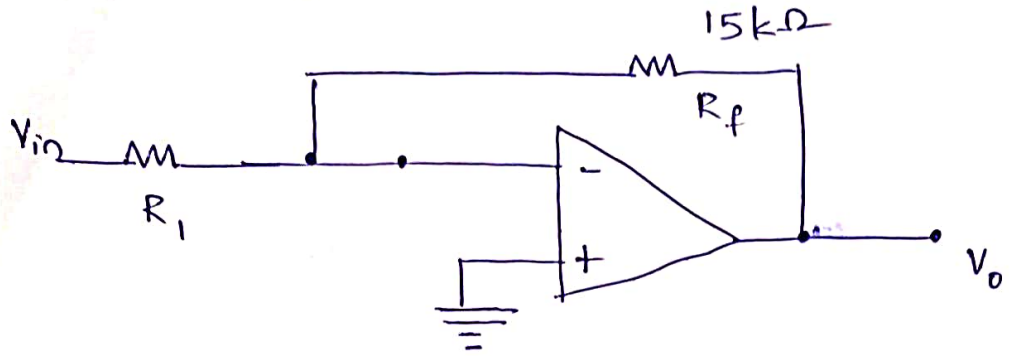
Gain $\frac{R_f}{R_1} = 15$

$$R_f = 15R_1$$

Take $\boxed{R_1 = 1\,k\Omega}$

then $\boxed{R_f = 15\,k\Omega}$

The designed circuit can be drawn as below.



For non-inverting amplifier,

$$V_o = \left(1 + \frac{R_f}{R_1}\right) V_{in}.$$

Given gain = 15

$$1 + \frac{R_f}{R_1} = 15$$

$$\frac{R_f}{R_1} = 15 - 1 = 14$$

$$R_f = 14 R_1$$

Take $\boxed{R_1 = 1\,k\Omega}$

Then $\boxed{R_f = 14\,k\Omega}$

Designed circuit