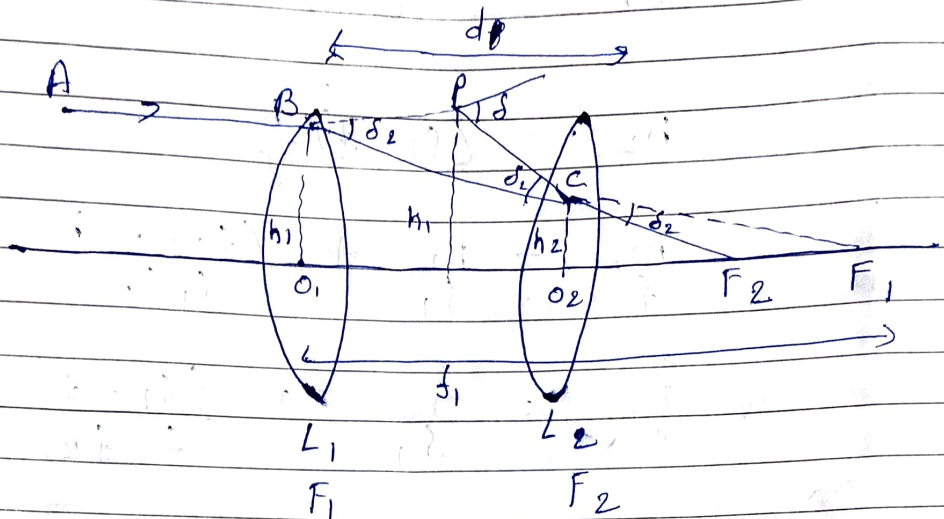


## B.Sc Part - II

Equivalent focal length of combination of two thin lenses

Separated by a finite distance



Let two thin lens  $L_1$  and  $L_2$  having focal lengths  $f_1$  and  $f_2$  separated by a distance  $d$ .

From  $\triangle PBC$

Exterior angle = Interior angle

$$\delta = \delta_1 + \delta_2 \quad \left[ \delta = \frac{h}{f} \right]$$

$$\delta = \frac{h_1}{f_1} + \frac{h_2}{f_2} \quad \text{--- (i)}$$

From figure

$$\delta = \frac{h_1}{f} \quad \text{--- (ii)}$$

$$\frac{h_1}{f} = \frac{h_1}{f_1} + \frac{h_2}{f_2} \quad \text{--- (iii)}$$

In  $\Delta BO_1F_1$  and  $\Delta CO_2F_1$

$$\frac{h_1}{f_1} = \frac{h_2}{(f_1 - d)}$$

$$h_2 = (f_1 - d) \frac{h_1}{f_1}$$

$$\frac{h_1}{f} = \frac{h_1}{f_1} + \frac{(f_1 - d) h_1}{f_1 f_2}$$

$$\frac{1}{f} = \frac{1}{f_1} + \frac{(f_1 - d)}{f_1 f_2}$$

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$$

— x —