Date
Page

1- a) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{90} + \frac{1}{45} = \frac{1}{30}$

$\Rightarrow f = +30\,cm$

$\Rightarrow$ Obj dis becomes $\rightarrow -45 - 5 = -50\,cm$

$\Rightarrow$ image dis $\Rightarrow$ $\frac{1}{v_0} + \frac{1}{50} = \frac{1}{30}$

$\Rightarrow \frac{1}{v_0} = \frac{50-30}{50 \cdot 30} = \frac{2}{150} = \frac{1}{75}$

$\Rightarrow v_0 = 75\,cm$

$\Rightarrow |v - v_0|$ = shift in img

$\Rightarrow$ Shift in image is 15cm

b) $P = \frac{1}{f} = \frac{1}{+30cm} = \frac{100}{30} = +3.33$ Diopters

2- $P_1 = +3D$, $P_2 = -1.5D$ } so $P_1 + P_2 = P_0 = +1.5D$

$\Rightarrow P_0 = +ve$

~~So Convex Lens is~~

a) $\Rightarrow$ So, Light rays will converge

b) $F_0 = \frac{1}{P_0} = \frac{1}{1.5} = 66.66\,cm$

c) $P_0 = P_1 + P_2 = +1.5$ Diopters

3) $\frac{1}{f_n} = \frac{1}{-0.25} + \frac{1}{f} = -4 + \frac{1}{f}$

Given :- $u = -0.2m$, $m = \pm 5$ (Real image may be below or above principal axis)

$\Rightarrow \frac{f_n}{f_n - u} = m$

$\Rightarrow \frac{f_n}{f_n + 0.2} = 5$

$\Rightarrow \frac{4f_n}{5} = -0.2$

$\Rightarrow f_n = \frac{-1}{4}$

$\Rightarrow -4 + \frac{1}{f} = \frac{-1}{4}$

$\Rightarrow \frac{1}{f} = 4 - \frac{1}{4} = \frac{15}{4}$

$\Rightarrow f = +\frac{4}{15}$ (if $m = +5$)

$\Rightarrow$ Converging Lens

$\frac{f_n}{f_n - 0.2} = -5$

$\Rightarrow 6f_n = 1$

$\Rightarrow f_n = \frac{1}{6}$

$\Rightarrow -4 + \frac{1}{f} = \frac{1}{6}$

$\Rightarrow \frac{1}{f} = 4 + \frac{1}{6} = \frac{25}{6}$

$\Rightarrow f = +\frac{6}{25} m$ (if $m = -5$)

$\Rightarrow$ Converging lens

4) a) $f = 20cm = \frac{1}{5} m$

$\Rightarrow P = \frac{1}{f} = +5D$

So, $(10 - 5)D = +5D$

So, $+10D$ & $-5D$ is used

b) $f = -10cm = -\frac{1}{10} m$

$\Rightarrow P = \frac{1}{f} = -10D$

$\Rightarrow (-20 + 10)D = -10D$

So, $-20D$ & $+10D$ is used

c) $f = -20\,cm = -\frac{1}{5}\,m$

$P = \frac{1}{f} = -5D$

$\Rightarrow (-10+5)D = -5D$

So, $-10D$ & $+5D$ is used

d) $f = \frac{20}{3}\,cm = -\frac{1}{15}\,m$

$P = \frac{1}{f} = -15D$

$\Rightarrow (-20+5)D = -15D$

$\Rightarrow$ So, $-20D$ & $+5D$ is used