10. $u_1 = -45\ cm$

$v_1 = 90\ cm.$

$\frac{1}{F} = \frac{1}{v_1} + \frac{1}{u_1}, \Rightarrow \frac{1}{F} = \frac{1}{90} - \frac{1}{45} = \frac{1+2}{90}$

$= \frac{3}{90_{30}} = \frac{1}{30}\ cm$

$\Rightarrow F = 30\ cm.$

$u_2 = (-45-5)m = -50\ cm.$

$\frac{1}{v_2} = \frac{1}{F} + \frac{1}{u_2}$

$\frac{1}{v_2} = \frac{1}{30} - \frac{1}{50} = \frac{-5+9}{150}$

$\frac{1}{v_2} = \frac{1}{30} + \frac{1}{-50} = \frac{5-3}{150} = \frac{2}{150} = \frac{1}{75}$

$\Rightarrow v_2 = 75\ cm.$

$(v_2) = 75\,cm$

Power of lens $= P = \frac{1}{F} = \frac{1}{30} = \frac{100}{30} = \frac{10}{3}$

$= 3.\bar{3}\,m$

2. Power of lens $= +3D$.

$\Rightarrow f_1 = \frac{1}{3}\,m$

Power of lens$_2 = -1.5D$.

$\Rightarrow f_2 = \frac{-15\,cm}{10} = \frac{-10}{5}\,m = -\frac{2}{3}$

$F = \frac{f_1 + f_2}{f_2 + f_2} = \frac{1/3 \times -2/3}{1/3 + -2/3} = \frac{-2/9}{-1/3} = \frac{2}{9} \times 3$

$= \frac{2}{3}\,m$.

Power of combination $= \frac{1}{F}$

$= \frac{3}{2}\,m = \frac{3}{2}\,D$

$\therefore f_1 > f_2$

It will be divergent combination.

3. Let f_1 be the focal length of convex lens & f_2 be the focal length of concave lens.

$f_2 = 0.25\,m$.

$u = 0.2\,m$

$m = -5$

$\frac{v}{u} = -5 \Rightarrow v = -0.2m \times 5 = 1\,m$

$\frac{1}{v} - \frac{1}{u} = \frac{1}{F} \Rightarrow F = \frac{1}{3}\,m$

we know that,

$$\frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$$

$$\Rightarrow 6 = \frac{1}{F_1} - 4$$

$$\Rightarrow \frac{1}{F_1} = 6 + 4 = 10\,m$$

$$\Rightarrow F_1 = \frac{1}{10}\,m = 0.1\,m.$$

$\therefore$ Convex lens.

4: i) $P = P_1 + P_2$

$$P = \frac{1}{F} = \frac{1}{F_1} + \frac{1}{F_2}$$

Let $P_1 = 10D$ and $P_2 = 5D$

$$P = P_1 + P_2 = 10D - 5D = 5D.$$

$$\therefore F = \frac{100}{5} = 20\,cm.$$

(ii) $P = 10D - 20D$

$$= -10D$$

$$F = \frac{100}{-10} = -10\,cm.$$

(iii) $P = -5D$

$$f = \frac{100}{-5} \quad F = -20\,cm.$$

iv) $P = 15D$

$$F = \frac{100}{15} = \frac{20}{3}\,cm$$