

Q. A thin convex and a thin concave lens each of 50cm focal length are co-axially situated and separated by 10cm. Find the position and Nature of final image formed of an object placed 20cm from the convex lens.

$$f_1 = +50\text{cm}, f_2 = -50\text{cm}$$

$$F = \frac{f_1 f_2}{f_1 + f_2 - d}$$

$$F = \frac{50 \times -50}{50 - 50 - 10}$$

$$= \frac{-2500}{-10} = 250$$

$$f = 250 \text{ cm}$$

$$\alpha_1 = \frac{df}{F_2} = \frac{10 \times 250}{-50} = \frac{250}{-5}$$

$$\alpha_1 = -50 \text{ cm}$$

$$u = +30 \text{ cm}$$

$$\frac{1}{f} = -\frac{1}{u} + \frac{1}{v}$$

$$\frac{1}{250} = -\frac{1}{30} + \frac{1}{v}$$

$$\frac{1}{v} = \frac{1}{250} + \frac{1}{30}$$

$$\frac{1}{v} = \frac{30 + 250}{7500}$$

$$v = \frac{7500}{980}$$

$$v = \frac{750}{98}$$

$$v = 26.8 \text{ cm}$$

$$m = \frac{v}{u} = \frac{26.8}{30}$$

$$m = 0.89$$