PYQ Solution [IIT-JAM]

(Chapter 2 Interference)

Ans. 1: (a)

Solution: The locus of constant path difference on plate P_2 is straight line. Therefore on plate P_2 interference fringes are straight line in nature. Whereas on plate P_1 the locus of constant path difference is circular, therefore fringes are circular

Ans. 2: (d)

Solution: For two slits, $I_2 = (a+a)^2 = 4a^2$

For three slits, $I_3 = (a+a+a)^2 = 9a^2$

$$\therefore \frac{I_2}{I_3} = \frac{4}{9} \Rightarrow I_2 = \frac{4}{9} I_3$$

Ans. 3: (a)

Solution: $\phi_1 = \frac{k_0}{2}\left(\sqrt{3x} + y\right) - \omega t$, $\quad \phi_2 = \frac{k_0}{\sqrt{2}}(x+y) - \omega t$

$$\Delta\phi = \phi_1 - \phi_2 = \frac{k_0}{2}\left[\sqrt{3}x + y - \sqrt{2}x - \sqrt{2y}\right] = \frac{k_0}{2}\left[\left(\sqrt{3}-\sqrt{2}\right)x + \left(1-\sqrt{2}\right)y\right]$$

For maxima: $\Delta\phi = 2m\pi$

$$\frac{k_0}{2}\left[\left(\sqrt{3}-\sqrt{2}\right)x + \left(1-\sqrt{2}\right)y\right] = 2m\pi$$

$$\left(\sqrt{3}-\sqrt{2}\right)x + \left(1-\sqrt{2}\right)y = \frac{4m\pi}{2\pi/\lambda} = 2m\lambda$$