## DPP 01

## Solution

**1.** Coherent source of light are those sources which emit a light wave having the same frequency, wavelength and in the same phase or they have a constant phase difference

**2.** For $2\pi$ phase difference $\rightarrow$ Path difference is $\lambda$

$\therefore$ For $\phi$ phase difference $\rightarrow$ Path difference is $\frac{\lambda}{2\pi} \times \varphi$

**3.** Resultant intensity $I_R = I_1 + I_2 + 2\sqrt{I_1 I_2}cos\varphi$

For maximum $I_R, \varphi = 0°$

**4.** $\frac{I_{max}}{I_{min}} = \left[\frac{\sqrt{\frac{I_1}{I_2}}+1}{\sqrt{\frac{I_1}{I_2}}-2}\right]^2 = \left[\frac{\sqrt{\frac{4}{1}}+1}{\sqrt{\frac{4}{1}}-2}\right]^2 = \frac{9}{1}$

**5.** $\frac{I_{max}}{I_{min}} = \left[\frac{\sqrt{\frac{a_1}{a_2}}+1}{\sqrt{\frac{a_1}{a_2}}-1}\right]^2 = \left[\frac{\sqrt{\frac{4}{3}}+1}{\sqrt{\frac{4}{3}}-2}\right]^2 = \frac{49}{1}$

**6.** The interference fringes can be observed with coherent sources of light which have a constant initial phase difference and same frequency.

**7.** Visibility $V = \frac{I_{\max}-I_{\min}}{I_{\max}+I_{\min}} = \frac{2\sqrt{I_1 I_2}}{(I_1+I_2)}$

**8.** For given Young's double slit experiment,

$$N_1\lambda_1 = N_2\lambda_2 \therefore N_2 = \frac{N_1\lambda_1}{\lambda_2} = \frac{16 \times 700}{400} = 28$$

**9.** $\lambda = 500$ nm, $d = 0.05$ mm Angular fringe width,

$\beta = \frac{\lambda}{d} = \frac{500\times10^{-9}}{0.05\times10^{-3}} = 0.01$ radian $= 0.57°$

**10.** $\frac{I_{\max}}{I_{\min}} = \frac{(a_1+a_2)^2}{(a_1-a_2)^2} = \frac{(1+3)^2}{(1-3)^2} = \frac{16}{4} = \frac{4}{1} = 4$