Condition for Maxima and Minima of interference of light

Let the magnitude of electric field vector due to the two individual waves at point P is given by –

$$E_1 = a_1 \sin \omega t \qquad \text{.....(1)}$$

$$E_2 = a_2 \sin (\omega t + \phi) \qquad \text{.....(2)}$$

Where, a_1 and a_2 are amplitudes of two individual waves.

Then according to principle to superposition, the magnitude of resultant field.

$$E = E_1 + E_2 = A \sin (\omega t + \delta) \qquad \text{.....(6)}$$

$\delta = \tan^{-1}\left(\dfrac{a_2 \sin\phi}{a_1 + a_2 \cos\phi}\right)$ is the initial phase of the resultant wave.

Thus, the resultant electric field vector is also oscillating in nature with angular frequency ω and amplitude A.

$$A = \sqrt{a_1^2 + a_1^2 + 2a_1 a_2 \cos\phi} \qquad \text{.....(7)}$$

a_1 and a_2 are constant but the value of ϕ change from one point to another (because it depends upon path difference). So intensity of resultant wave is given by-