Short Answers Questions. — Unit - 1

(1) Define Interference & Diffraction.

Ans. Def. of Interference

"When two or more waves having same frequency and constant phase difference superpose on each other, the intensity of light is modified so the modification of intensity of light due to superposition of waves is called Interference."

Def of Diffraction

"The phenomena dealing with bending of light waves around the edge of an obstacle is called Diffraction."

(2) Describe Superposition Principle -

Ans "When two or more waves acting simultaneously at a point in the medium the resultant displacement of a particle at that point at any instant of time is the algebraic sum of the displacements of the same particle due to individual waves in absence of others."

If $y_1, y_2, y_3 \ldots$ are the displacements of individual waves, the resultant displacement is $y = y_1 + y_2 + y_3 + \ldots$

(3) Write any 3 conditions for Interference.

Ans. To obtain a permanent or stationary interference pattern

(1) The two sources must be coherent

(2) Amplitudes of interfering waves must be equal.

(3) Distance between source & screen (D) should be large.

4, What are types of Interference

(1) Division of wave front : In this case wavefront is divided into 2 parts by the phenomena of reflection & refraction.

Ex Young's Double slit experiment

2. Division of Amplitude : In this case the amplitude of incident light is divided into two parts by parallel reflection & refraction.

Ex Newton's rings experiment.

5, What are the conditions for bright (max) & dark (min) for air film to appear in case of reflected geometry.

Ans

condition for max

$2\mu t \cos r = (2n+1)\lambda/2 \quad (n = 0, 1, 2, 3 \ldots)$

condition for min

$2\mu t \cos r = n\lambda \quad (n = 0, 1, 2, 3 \ldots)$

6, Write expression for wavelength (λ) & Refractive index.

Ans. Wavelength $\lambda = \dfrac{D_{n+p}^2 - D_n^2}{4PR}$

Refractive Index $\mu = \dfrac{D_{n+p}^2 - D_n^2}{D_{n+p}'^2 - D_n'^2}$

7. What are the differences between Interference & Diffraction

Ans.

Interference	Diffraction
(1) The interaction takes place between two seperate wavefronts originating from coherent sources.	(1) Interaction takes place between the secondary wavelets originating from different points of same wave front.
2. Fringe width may or may not be equal.	2. Fringe width of various fringes are never equal.
3. All bright fringes have the same intensity.	3. Bright fringes are of varying intensity
4. Regions of minimum intensity are perfectly dark.	4. Regions of minimum intensity are not perfectly dark.

8. What are the applications of Diffraction.

Ans (1) Structures of the crystal can be determined.
2. Size & shape of tumor, ulcers etc can be accessed by ultrasound scanning
3. Wavelength of x-rays can be determined by x-ray diffraction.

9. What are quarter & Half wave plates. and write the expressions for thickness.

Ans. Quarter wave plate.

For positive crystal $\mu_e > \mu_o$ $\therefore t = \frac{\lambda}{4(\mu_e - \mu_o)}$

For Negative crystal $\mu_e < \mu_o$ $\therefore t = \frac{\lambda}{4(\mu_o - \mu_e)}$.

Half wave plate.

For positive crystal $t = \frac{\lambda}{2(\mu_e - \mu_o)}$ For Negative Crystal $t = \frac{\lambda}{2(\mu_o - \mu_e)}$.

10, Define optic axis & principal section.

Ans The axis along which ordinary and extra-ordinary rays travel with same velocity is called optic axis.

Any plane which contains the optic axis and is perpendicular to two opposite faces is called principal section.