

Interference of light

Physics

II Year (IV Semester)

- ① ^{15M} Derive the expression for fringe width in biprism experiment.
- ② ^{15M} Describe the method to find out the thickness of a thin transparent film using a biprism.
- ③ ^{15M} Explain the occurrence of interference fringes in Lloyd mirror arrangement. (Phase change due to reflection of light).
- ④ ^{15M} Describe the fringes observed when a wedge-shaped film by normally reflected light. (Interference by a film with two non-parallel reflecting surface). Calculate the separation between two consecutive bright & dark bands.
- ⑤ ^{15M} Describe Newton's ring method for measuring the wavelength of monochromatic light. Give the necessary theory.
- ⑥ Describe and examine the formation of Newton's rings in reflected monochromatic light. Prove that in reflected light i) diameters of dark rings are $\propto \sqrt{n}$ ii) diameter of bright ring $\propto \sqrt{(2n+1)}$.
- ⑦ ^{15M} Describe the principle, construction and working of a Michelson's Interferometer. Explain how the wavelength of light is determined with it.
- ⑧ ^{5M} Explain the formation of colours in thin films.
- ⑨ ^{5M} Write a note on Non-Reflecting film.

③ 5M What is the thickness of Non-Reflecting film.

④ 5M Discuss the important conditions for interference of light.

Problems

i) Based on $\beta = \frac{\lambda D}{2d}$ ii) Based on $D_n^2 = 4Rn\lambda$

iii) Based on $\lambda = \frac{D_{n+p}^2 - D_n^2}{4Rp}$

Diffraction of light

① 5M Explain what is diffraction of light. Distinguish between the Fraunhofer and Fresnel classes of diffraction.

② 5M How is diffraction different from interference.

③ 5M Discuss the Fraunhofer diffraction due to single slit.

④ *** 15M Discuss the Fraunhofer diffraction due to double slit.

⑤ *** 15M What is diffraction grating? Explain the formation of spectra by diffraction grating.

⑥ 5M What do you mean by limit of resolution?

⑦ 5M Write a short note on zone plate.

⑧ *** 15M Explain the construction and working of a zone plate. Distinguish between zone plate and convex lens.

⑨ *** 15M Explain the term "half period zone". Calculate the area of a Fresnel zone.

Problems

i) Based on $f_n = \frac{r_n^2}{n\lambda}$ ii) Based on $(1/d)\lambda = n\lambda$

iii) $(1+d) \sin\theta = n\lambda$

Polarisation

- ① ^{5M} Write a short note on the law of malus.
- ② ^{5M} Explain the terms "plane of vibration" and "plane of polarisation".
- ③ ^{5M} Write a short note on Brewster's law.
- ④ ^{15M} What is double Refraction? Describe the Construction and working of Nicol's prism. Explain how it is used as polariser and analyser.
- ⑤ ^{5M} Give the Construction of Babinet's Compensator.
- ⑥ ^{5M} Explain how a quarter wave plate and half wave plate could be constructed?
- ⑦ ^{15M} Describe the Construction and working of Laurent's half-shade Polarimeter. \leftarrow ⑧ What is Specific Rotation?
- ⑨ ^{5M} Explain Huygens's theory.

i) Based on $t = \frac{\lambda}{4(\mu_e - \mu_o)}$

ii) Based on $\mu = \tan p$, $\sigma + p = 90^\circ$

iii) Based on $\delta = 0/\lambda c$

- ⑩ ^{5M} What is optical Activity?

Abberations

- ① ^{15M} What is chromatic aberration? Derive the Condition for achromatism when two lenses are as in contact

a) Separated by a distance

- ② ^{15M} Calculate longitudinal chromatic aberration of a thin lens when the object is situated i) at infinity

ii) at a finite distance.

3) ^{5M} Write short note on "coma"

4) ^{5M} Write short note on "astigmatism"

5) What is spherical aberration? Derive an expression for the minimising spherical aberration in the case of two lenses separated by a distance.
15/5marks

6) ^{5M} * How is spherical aberration reduced in lenses?

i) Based on $\frac{f_1}{f_2} = \frac{-w_1}{w_2}$; ii) Based on $\frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

iii) Based on $fR - fv = wfy$

7) ^{5M} What is fibre optics? Explain the principle of fibre optics.

8) ^{5M} Describe step index fibre

9) ^{5M} Describe graded index fibre

10) ^{5M} * Explain the difference between single and multimode transmission.

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