

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2024
(Fourth Semester)

Branch – PHYSICS

OPTICS

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 = 5)

1. The type of mirror which always forms a virtual image is a
 - a) concave mirror
 - b) convex mirror
 - c) plane mirror
 - d) spherical mirror
2. The secondary mirror used in Newton's telescope to reflect light into an eyepiece is a
 - a) Diagonal mirror
 - b) Parabolic mirror
 - c) Hyperbolic mirror
 - d) Planar mirror
3. The key difference between Fresnel and Fraunhofer diffraction is that
 - a) Fresnel diffraction occurs in the near field, while Fraunhofer diffraction occurs in the far field.
 - b) Fresnel diffraction involves a converging spherical wavefront, while Fraunhofer diffraction involves a parallel wavefront.
 - c) Fresnel diffraction occurs with coherent light, while Fraunhofer diffraction occurs with incoherent light.
 - d) Fresnel diffraction produces a single-slit diffraction pattern, while Fraunhofer diffraction produces a double-slit interference pattern.
4. What type of polarization is observed when the electric field vector of light waves trace out a helical path as it propagates?
 - a) Linear polarization
 - b) Circular polarization
 - c) Elliptical polarization
 - d) Random polarization
5. Which of the following is NOT a type of fiber optic sensor?
 - a) Intrinsic sensor
 - b) Extrinsic sensor
 - c) Distributed sensor
 - d) Refractive sensor

SECTION-B (15 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 3 = 15)

- 6 a). Explain the total internal reflection of light.
(or)
b). Explain how chromatic aberration in lenses separated by a distance.
- 7 a). Describe the construction and working of a Galileo's telescope.
(or)
b). With a neat diagram explain the construction and working of a constant deviation spectrometer.

Cont...

- 8 a). White light is incident on a soap film at an angle $\sin^{-1} 4/5$ and the reflected light is observed with a spectroscope. It is found that two consecutive dark bands corresponding to wavelengths $6.1 \times 10^{-7} \text{ m}$ are arising. If the refractive index of the film be $4/3$, calculate its thickness.
(or)
- b). Newton's rings are formed with red light having $\lambda = 670 \text{ nm}$. The radius of the 20th ring is found to be $1.1 \times 10^{-2} \text{ m}$. Find the radius of curvature of the lens and the radius of 30th ring.
- 9 a). Describe how a Nicol prism can be used as an analyzer.
(or)
- b). Give the Fresnel's explanation for the rotational polarization of light.
- 10 a). Mention the advantages of optical fibers.
(or)
- b). Explain the fiber optic communication system.

SECTION-C (30 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 6 = 30)

11. (a) Explain spherical aberration in a lens. Explain how is it caused and the ways to minimize it.
(or)
- (b) What is coma? Hence give the theory of alplantism of thin lenses.
12. (a) Explain the principle, construction and working of a Newtonian telescope.
(or)
- (b) Give the construction and working of a Ramsden eyepiece. How are chromatic and spherical aberrations minimized in this eyepiece?
13. (a) Give the theory of interference of light by thin films. Hence explain the formation of Newton's Rings and the measurement of the wavelength of light using this experiment.
(or)
- (b) Discuss Fraunhofer diffraction due to a single slit. Draw a curve indicating distribution of light in the diffraction pattern.
14. (a) Discuss polarization phenomenon due to reflection of light waves. Hence state Brewster's law and explain any one of its applications.
(or)
- (b) Give the construction and working of a Laurent's half-shade polarimeter.
15. (a) Explain the construction and reconstruction of a hologram and the applications of holography.
(or)
- (b) Explain the principle and operation of any one fiber-optic sensors.