22PHU411 / 20PHU11

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 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 law of reflection states that
   i) The angle of incidence is equal to the angle of transmission.
   ii) The angle of incidence is equal to the angle of reflection.
   iii) Light travels in straight lines.
   iv) The speed of light depends on the medium it travels through.

2. In Newton's telescope, the type of mirror used to gather and focus light is
   i) convex mirror ii) concave mirror
   iii) plane mirror iv) spherical mirror

3. When light waves encounter an aperture or obstacle with dimensions of the order of the wavelength, then which of the following effect will occur?.
   i) Fraunhofer diffraction ii) Fresnel diffraction
   iii) Rayleigh scattering iv) Mie scattering

4. When unpolarized light passes through a polarizing filter,
   i) It becomes completely polarized. ii) It becomes partially polarized.
   iii) It remains unpolarized. iv) It becomes circularly polarized.

5. The fundamental principle of fiber optic sensors is
   i) Photoelectric effect ii) Total internal reflection
   iii) Compton scattering iv) Doppler effect

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a) What are the common defects in the images produced by a single lens? How can these defects be removed?

OR

b) Explain the Fermat's principle of least time.

7 a) Compare Ramsden and Huygen Eyepiece.

OR

b) Explain how Abbe's Spectrometer is used to study the refractive index of a liquid.

8 a) Newton's rings are formed with reflected light of wave length 5.895×10^{-7} m with a liquid between the plane the curved surfaces. The diameter of the 5^{th} dark ring is 0.003m and radius of curvature of the curved surface is one meter. Calculate the refractive index of the liquid.

OR

b) Deduced the missing orders for a double slit Fraunhofer diffraction pattern, if the slit widths are 0.16mm and they are 0.8mm apart.

9 a) Explain Polarization by reflection and thereby obtain Brewster's law.

OR

b) What is optical activity? Describe Fresnel's explanation for optical activity.

Cont...

10 a) Explain the theory of Holography.

OR

b) Explain the fiber optic sensors.

SECTION -C (30 Marks)

Answer **ALL** questions

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

11. (a) Explain what is meant by chromatic aberration in lenses separated by a distance.

OR

(b) Give the theory of spherical aberration at a single surface.

12. (a) Give principle, construction and working of a compound microscope.

OR

(b) Discuss the Principle construction & working of Huygens eyepiece.

13. (a) Explain the construction and working of a Michelson's Interferometer.

OR

(b) Discuss Fraunhofer diffraction pattern of a circular aperture.

14. (a) Describe how a Nicol prism can be used as an analyzer.

OR

(b) Describe the experimental determination of optical activity of liquids using a Laurent's Half-shade polarimeter.

15. (a) Using a block diagram describe the functioning of a fiber optic communication system.

OR

(b) Explain the industrial and medical applications of fiber optics.

Z-Z-Z END