

[88-EJ]

SARDAR PATEL UNIVERSITY - V V NAGAR

DATE: 2-01-2021, Saturday

BSc SEMESTER-III SUBJECT: PHYSICS

TIME: 2:00 TO 4:00 pm

PAPER CODE: US03CPHY21 PAPER TITLE: OPTICS

TOTAL MARKS: 70

Q.1 MULTIPLE CHOICE QUESTIONS

[10]

- (1) The power of a lens is the ----- of its focal length.
(a) reciprocal (b) proportional (c) double (d) none
- (2) The distance between two----- points is always equal to the distance between two principal points.
(a) cardinal (b) nodal (c) focal (d) none
- (3) The bending of wave at an edge of an obstacle is called -----
(a) refraction (b) reflection (c) interference (d) diffraction
- (4) For multiple beam interferometry the visibility of fringes depends upon ----- coefficient.
(a) refraction (b) absorption (c) transmission (d) reflection
- (5) Fresnel's Biprism works on the principle of -----
(a) phase splitting (b) wave front splitting (c) frequency splitting (d) amplitude splitting
- (6) According to Hugen's theory shape of wavefront for ordinary ray is -----
(a) parabola (b) ellipsoid (c) spherical (d) none
- (7) When the optical path difference between two linearly polarized waves vibrating at right angles is zero, then resulting wave is -----
(a) plane polarized (b) circularly polarized (c) elliptically polarized (d) unpolarized
- (8) If quarter wave plate introduces 90° phase difference between Ordinary ray and Extra-ordinary ray then path difference is -----
(a) $\lambda/2$ (b) $\lambda/4$ (c) λ (d) 4λ
- (9) The numerical aperture is defined as the -----of the acceptance angle.
(a) sine (b) cosine (c) tan (d) cot
- (10) The propagation of light in an optical fibre base on the principle of -----
(a) total internal reflection (b) refraction (c) dispersion of light (d) none

Q.2 FILL IN THE BLANKS

[8]

- (1) $\Delta = d - (f_1 + f_2)$ is called -----between two lenses.
 - (2) Radii of the dark fringes are proportional to -----
 - (3) Calcite is an example of ----- crystal.
 - (4) Full form of GRIN Fibre is -----
- WRITE TRUE OR FALSE
- (5) Power of lens is measured is called a diopter (D).
 - (6) In Newton's ring the thickness of the air film is negligibly small compared to a wavelength of light.
 - (7) In Calcite crystal the relation between velocities of O- ray and E- ray is given by $V_o > V_e$
 - (8) The Inner most region of optical fibre known as core.



Q.3 Short Answer Questions (Attempt any 10 out of 12)

[20]

- (1) Obtain focal length of the equivalent lens having two lens L1 and L2 ($f = f_1 f_2 / f_1 + f_2 - d$)
- (2) Define spherical aberration.
- (3) Give merits and demerits of Ramsden eye piece.
- (4) Give two points of comparison of Biprism and Lloyd's mirror.
- (5) What is the advantage of Fabry parot interferometer over Michelson interferometer.
- (6) Give the name of the techniques for obtaining interference.
- (7) Write main difference between quarter wave plate and half wave plate.
- (8) Using Brewster's law show that the reflected rays and refracted rays are at right angles. ($i + r = \pi/2$)
- (9) Define isotropic and anisotropic materials with examples.
- (10) Explain fractional refractive index change.

[1]

[P.T.O.]

(11) Draw block diagram of fibre optic communication system.

(12) What is the step index fibre?

Q.4 Long Answer Questions (Attempt any 4 out of 8)

[32]

- (1) Explain in details Huygens eye piece along with its cardinal points and derive necessary equations.
 - (2) With proper diagram discuss the cardinal points and cardinal planes of a coaxial lens system.
 - (3) Explain the experimental arrangement to observe Newton's ring and how it is used to determine the wavelength of light.
 - (4) Explain the experimental arrangement of Fresnel Biprism and determine the wavelength of light.
 - (5) Explain construction and working of Nicol prism.
 - (6) Obtain equation for the thickness of Quarter wave plate and Half wave plate.
 - (7) Obtain an expression for critical angle of propagation of an optical fibre.
 - (8) Deduce an expression for acceptance angle of an optical fibre.
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[2]

[1]

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