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NO. OF PAGES: 2

SARDAR PATEL UNIVERSITY**Third (III) Semester (CBCS) B. Sc. Examination-2013**Saturday, 16th November- 2013

Time: 02:30 P.M. To 05:30 P. M.

Subject: PHYSICS [US03CPHY01]

OPTICS**Total Marks: 70****Note: All the symbols have their usual meanings.****Q-1****To answer the MCQs choose the correct option.****[10]**

- (1) If spreading of the image takes place along the lens axis, the aberration is called _____.
(a) curvature of field (b) coma (c) astigmatism (d) distortion
- (2) For Hygen's eyepiece, the focal length of the field lens is _____ times the focal length of the eye lens.
(a) five (b) two (c) four (d) three
- (3) The biprism is used to show _____ phenomenon.
(a) interference (b) diffraction (c) polarization (d) reflection.
- (4) In Newton's ring experiment _____ lens is used.
(a) convex (b) plano concave (c) concave (d) plano convex
- (5) The Fabry -Perot interferometer consists of _____ optically plane parallel highly reflecting glass plates.
(a) four (b) three (c) two (d) six
- (6) According to Hygen's theory shape of wavefront for extraordinary ray is _____.
(a) parabola (b) ellipsoid (c) spherical (d) hyperbola.
- (7) When the optical path difference between two linearly polarized waves vibrating at right angles is zero, then resultant wave is _____.
(a) plane polarized (b) circularly polarized (c) elliptically polarized (d) unpolarized
- (8) When unpolarized light passes through a polarizer, the intensity of the transmitted light will be exactly _____ of the intensity of incident light.
(a) double (b) half (c) same as (d) quarter.
- (9) The refractive index of the core material is _____ the refractive index of the cladding.
(a) less than (b) equal to (c) slightly greater than (d) very much less than
- (10) The numerical aperture of optical fibre is defined as _____ of acceptance angle.
(a) cot (b) cosine (c) tan (d) sine

Q-2**Short answer questions (Attempt Any Ten).****[20]**

- (1) Define spherical aberration.
- (2) Define distortion. Name two types of it.
- (3) Give any two points to compare Ramsden's eyepiece and Hygen's eyepiece.
- (4) Explain briefly about the different techniques to obtain interference fringes.

- (5) What is the advantage of Febry-Parot interferometer over Michelson interferometer?
- (6) Draw the intensity distribution of light when it is diffracted by a narrow wire and thick wire.
- (7) What is double refraction? Give the name of crystals which are doubly refracting.
- (8) What are the functions of polarizer and analyzer?
- (9) Distinguish between elliptically and circularly polarized light.
- (10) Mention the important functions of cladding.
- (11) Explain in brief fractional refractive index change.
- (12) Mention any four advantages of optical fibre.

Q-3 For a co-axial lens system, enlist the cardinal points and discuss them in detail. [10]

OR

Q-3 Discuss the construction of Ramsden's eyepiece and calculate the positions of cardinal points of the eyepiece. Also locate cardinal points in the diagram. Which are the merits and demerits of Ramsden's eyepiece? [10]

Q-4 (a) Give construction and working of biprism. How does it is used to measure thickness of thin transparent glass sheet? [06]

(b) Explain construction and working's Llyod's single mirror. [04]

OR

Q-4 (a) Explain the experimental arrangement to observe the Newton's ring and show how it is used to determine the wavelength of light. [06]

(b) What is diffraction? Explain (i) Fresnel diffraction and (ii) Fraunhofer diffraction. [04]

Q-5 (a) Explain the theory of superposition of waves linearly polarized at right angles. [06]

(b) Give the construction of Nicol prism and explain its working. [04]

OR

Q-5 (a) Describe construction and working of Polaroid sheet. Explain its use as polarizer and analyzer. [06]

(b) Give the Hygen's explanation of double refraction in uniaxial crystal. [04]

Q-6 (a) Obtain the formula for critical angle of propagation, $\theta_c = \cos^{-1} \frac{n_2}{n_1}$ for a step index fibre. [06]

(b) With necessary diagram, explain single mode step index fibre. [04]

OR

Q-6 (a) Discuss in detail single fibre cable and multi fibre cable. [06]

(b) State advantages and disadvantages of step index multimode fibre. [04]

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