

SEAT No. _____

SARDAR PATEL UNIVERSITY

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E+M

S. Y. B.Sc. Examination: SEMESTER - III
COURSE: PHYSICS CODE: US03CPHY21
COURSE TITLE: OPTICS

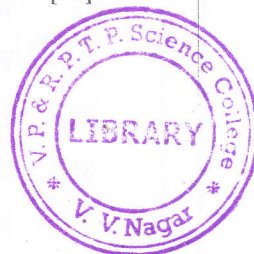


Date: 1/12/2021
Time: 3:00 to 5:00

Total Marks: 70

Q-1 Answer the following multiple choice questions: (All questions are compulsory) [10]

1. _____ points are also called the *unit points*.
(a) Principal (b) Focal (c) Nodal (d) None of these
2. The ratio of the focal lengths of field lens to eye lens in Huygen eyepiece is _____.
(a) 2:1 (b) 1:3 (c) 3:1 (d) 2:3
3. Lloyd's Mirror works on the principle of _____.
(a) Phase splitting (b) Wavefront splitting
(c) Frequency splitting (d) Amplitude splitting.
4. If the distance between the slits is increased in Fraunhofer Double Slit Experiment, the angular separation between any two consecutive maxima or minima _____.
(a) becomes zero (b) increases (c) remains constant (d) decreases
5. _____ type of lens with a large radius of curvature is used in the experiment of Newton's Rings.
(a) Concave (b) Plano-concave (c) Convex (d) Plano-convex
6. To obtain polarization using "pile of plates", the glass plates are kept inclined at an angle of _____° to the axis of the tube-holder (or incident parallel light rays).
(a) 45 (b) 33 (c) 57 (d) 63
7. _____ is an example of biaxial crystal.
(a) topaz (b) tourmaline (c) calcite (d) quartz
8. The property of "*selective absorption*" observed in some material, is scientifically referred to as _____.
(a) birefringence (b) refraction (c) dichroism (d) diffraction
9. The *Fractional Refractive Change* is in general of the order of _____.
(a) 0.1 (b) 0.01 (c) 1.0 (d) 1.01
10. Core of an *Optical Fibre* is made-up of _____ material.
(a) Conducting (b) Non-conducting (c) Dielectric (d) Semi-conducting



Q-2 Answer the following questions as asked: [08]

- 1) In 1841 _____ showed that any number of coaxial lenses can be treated as a single unit.
- 2) "The variation in colour of image produced by a lens for different axial distances is called *Distortion*" – This statement is *True* or *False* ?
- 3) The principal used in obtaining Newton's Rings is _____.
- 4) "Lummer and Gehrcke Plate is used for observing the fine structure of spectral lines in Zeeman Effect" – This statement is *True* or *False* ?
- 5) Water is an _____ material. (*isotropic, anisotropic*)
- 6) _____ is same for both elliptically and circularly polarized light. (*phase difference, amplitude*)
- 7) The common name of "Perfluorinated ethylene propylene" is _____.
- 8) Scientist _____ assigned the term *Fiber Optics*.

(P.T.O.)

Q-3 Answer the following questions in short. (Any ten)

[20]

- 1) With neat diagrams explain Principal Planes and Principal Points for a system of two lenses.
- 2) Explain the term "Lens Aberration". State its types and sub-types.
- 3) Give merits and demerits of Huygens eyepiece.
- 4) Give three points of comparison between fringes produced by Biprism and Lloyd's mirror.
- 5) What is diffraction of light? Explain briefly the types of diffraction with diagram.
- 6) With a diagram explain how Newton's Rings are formed.
- 7) Explain the functions of *Polarizer* and *Analyser* with respect to polarization of light.
- 8) State and prove Brewster's Law.
- 9) How elliptically polarized light is produced? Explain with a diagram.
- 10) Explain the necessity of *Cladding* in an optical fibre.
- 11) Give characteristics of Step-index multi-mode fibre.
- 12) List the merits of Optical fibres.

Q-4 Attempt the following long answer questions (any four):

[32]

- 1) Discuss spherical aberration observed in a lens. Explain different methods to reduce this aberration. Draw figures and derive equations where ever necessary.
- 2) Discuss Huygens eyepiece with necessary equations and figure. Obtain cardinal points for this eyepiece with equations.
- 3) Explain the construction and experimental arrangement of Biprism. Discuss the method to determine the wavelength of light using biprism.
- 4) Explain diffraction at a double-slit. Discuss its interference and diffraction maxima and minima with necessary equations.
- 5) Discuss in detail the construction and working of Nicol's Prism.
- 6) What is specific rotation? Explain construction and working of Laurent's Half shade Polarimeter.
- 7) Discuss structures of Single Mode step index fibre, Multimode step index fibre and Graded index fibre. Explain propagation of light through them.
- 8) (a) Explain critical angle of propagation and derive its equation with proper diagram.
(b) Discuss medical and military applications of optical fibre.

