

SEAT No. _____

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[79]

SARDAR PATEL UNIVERSITY
S.Y.B.Sc. Examination, Semester – 3
Saturday, 2nd January 2021
Time: 2.00 pm To 4.00 pm
Applied Physics Course Code: US03CAPH21
Course Title: Optics and Remote Sensing

Total Marks : 70

Q-1 Write answers to the following multiple-choice questions in your answer book by [10] selecting the proper option. (All questions are compulsory. One mark each.)

- (1) ___ is an image forming device made of glass and bounded by two regular curved surfaces.
(a) lens (b) prism (c) biprism (d) mirror
- (2) Condition for the removal of spherical aberration is that the separation between two lenses must be
(a) $f_1 - f_2$ (b) $(f_1 + f_2)/2$ (c) $f_1 \cdot f_2$ (d) f_1/f_2
- (3) The principal planes are ___ to each other.
(a) perpendicular (b) conjugate (c) inclined (d) slanted
- (4) A device which is used to identify the plane of polarization of linearly polarized light is called ____.
(a) Analyzer (b) Polarizer (c) Nicol prism (d) Microscope
- (5) Between two principal planes all the light rays are assumed to be travelling ___ to the principal axis.
(a) parallel (b) perpendicular (c) inclined (d) vertical
- (6) On a rainy day, small oil films on water show brilliant colors. This is due to
(a) dispersion (b) interference (c) diffraction (d) Polarization
- (7) The path difference corresponding to a phase difference of π radian is ____.
(a) 2λ (b) $\lambda/2$ (c) $\lambda/4$ (d) λ
- (8) Interference in thin film is mainly because of
(a) Division of amplitude (b) Division of wave fronts
(c) Addition of amplitude (d) Addition of wave fronts
- (9) The ability of the sensor to discriminate the smallest object on the ground of different sizes is called ___ resolution.
(a) spatial (b) spectral (c) radiometric (d) temporal
- (10) The capability of a sensor to view the same target under similar conditions at regular interval is called ___ resolution.
(a) spatial (b) spectral (c) radiometric (d) temporal

Q-2 Fill in the blanks, or answer in True OR False in the following questions. (All questions [08] are compulsory. One mark each.)

- (1) The spherical aberration produced by convex lens is ____.
- (2) The point of intersection of principal plane with principal axis is known as principal point. True/False?
- (3) The light ray which obey the Snell's law in double refraction is known as ____.
- (4) The polarizing angle depends on the length of the medium. True/False?

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- (5) Light travels the fastest in diamond. True/False?
- (6) Colors in thin films are because of _____.
- (7) The visible range of electromagnetic spectrum falls between 0.4 and 0.7 μm . True/False?
- (8) In a _____ synchronous orbit all points at a given latitude have the same local mean solar time.

Q-3 Answer the following questions in brief. (Answer any Ten Questions. Two marks each.) [20]

- (1) Enlist the cardinal points of a lens system.
- (2) State the features of principal plane.
- (3) Write a short note on curvature of field.
- (4) Enlist the methods used to produce plane polarized light.
- (5) Write a short note on polarization by selective absorption.
- (6) What are Brewster's windows?
- (7) Write a short note on amplitude splitting.
- (8) Define and explain about thin films?
- (9) Write a short note on Fizeau fringes.
- (10) Define spectral bands.
- (11) Write a short note on emissivity.
- (12) Explain about spectral resolution.

Q-4 Answer the following questions in detail. (Answer any Four questions. Eight marks for each question) [32]

- (1) Derive the equation for longitudinal chromatic aberration in terms of disperse e power of lens for an object placed at infinity.
- (2) Write notes on following(4 Marks each) :
 - (a) Coma
 - (b) Astigmatism
- (3) Explain the applications of polarized light in sunglasses and stereoscopic movies.
- (4) Write a note on polarization by reflection and explain Brewster's law in detail.
- (5) Describe the construction of Fresnel Biprism and explain how it can be used to measure wavelength of a monochromatic source.
- (6) Obtain the conditions for maxima and minima in case of thin film interference due to transmitted light.
- (7) With the help of necessary diagram give a detailed account of electromagnetic radiation with reference to remote sensing.
- (8) Answer the following (4 Marks each) :
 - a) Discuss about absorption of electromagnetic radiation in the atmosphere.
 - b) Discuss about scattering of electromagnetic radiation in the atmosphere.