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SARDAR PATEL UNIVERSITY

S.Y.B.Sc. Examination, Semester – 3

Wednesday, 15th June, 2022

Time: 12.00 pm To 02.00 pm

Applied Physics Course Code: US03CAPH21

Course Title: Optics and Remote Sensing

15/06/22, - 12 TO 02 PM **Total Marks : 70**

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

(1) The spherical aberration produced by convex lens is_____.
(a)Negative (b) Positive (c) Zero (d) Neutral

(2) The principal planes are ___ to each other.
(a) perpendicular (b) conjugate (c) inclined (d) oblique

(3) The point of intersection of principal plane with principal axis is known as ___ point.
(a) focal (b) nodal (c) center (d) principal

(4) The polarizing angle depends on the _____ of the medium.
(a) Velocity (b) Refractive Index (c) Width (d) Height

(5) The light ray which obey the Snell's law of reflection and hence known as_____.
(a) Ordinary Ray (b) Transmitted Ray (c) Incident Ray (d) Extra Ordinary Ray

(6) When a light ray travelling in glass is incident on an air surface
(a) it will refract away from the normal (b) some of the light may be reflected
(c) all of the light may be reflected (d) all of A, B, and C

(7) Colors in thin films are because of
(a) Dispersion (b) Compton effect (c) Interference (d) Diffraction

(8) Light travels the fastest in
(a) vacuum (b) water (c) glass (d) diamond

(9) The visible range of electromagnetic spectrum falls between __ and ___ μm.
(a) 0.4 & 0.7 (b) 0.5 & 0.7 (c) 0.6 & 0.7 (d) 0.3 & 0.7

(10) In a ___ synchronous orbit all points at a given latitude have the same local mean solar time.
(a) sun (b) geo (c) moon (d) star

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

(1) ____ is an image forming device made of glass and bounded by two regular curved surfaces.

(2) Condition for the removal of spherical aberration is that the separation between two lenses must be (f_1+f_2). True/False?

(3) A device which is used to identify the plane of polarization of linearly polarized light is called _____.

(4) Between two principal planes all the light rays are assumed to be travelling parallel to the principal axis. True/False?

(P.T.O.)

(5) The path difference corresponding to a phase difference of π radian is $\lambda/2$. True/False?
(6) On a rainy day, small oil films on water show brilliant colors. This is due to ____.
(7) The ability of the sensor to discriminate the smallest object on the ground of different sizes is called ____ resolution.
(8) The capability of a sensor to view the same target under similar conditions at regular interval is called temporal resolution. True/False?

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

(1) State the features of principal plane.
(2) Enlist the types of monochromatic aberrations.
(3) Write a short note on distortion.
(4) Define polarized and unpolarized light.
(5) Write a short note on polarization by scattering.
(6) Write a short note on anisotropic crystals.
(7) Explain the interference fringes obtained with Biprism using a white light source.
(8) What are thin films? Explain in brief.
(9) Write a short note on fringes of equal thickness.
(10) Define active and passive remote sensing.
(11) What is radiometric resolution?
(12) Write a short note on data product generation.

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

(1) Describe construction of image using cardinal points and derive Newton's formula.
(2) Derive the formula for Focal length 'f' of a combination of two thin lenses having focal lengths f_1 and f_2.
(3) Write a note on polarization by reflection and explain Brewster's law in detail.
(4) What are retarders? Discuss in detail about Quarter Wave Plate and Half Wave Plate.
(5) Answer the following (4 Marks each):
   a) What is Lloyd's mirror? How it can be used to determine wavelength of monochromatic light?
   b) Write a note on plane parallel film.
(6) Obtain the conditions for maxima and minima in case of thin film interference due to reflected light.
(7) Answer the following (4 Marks each) :
   a) Write a note on Thermal radiation.
   b) Discuss about the absorption of electromagnetic radiation in atmosphere.
(8) With the help of necessary diagram give a detailed account of electromagnetic radiation with reference to remote sensing.

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