SARDAR PATEL UNIVERSITY VALLABH VIDYANAGAR
B. Sc. 3rd SEMESTER EXAMINATION : NOVEMBER 2019

Subject: Applied Physics   Title: Optics and Remote Sensing   Code: US03CAPH21

Date: 25-11-2019 Monday   Time: 2:00 p.m. to 05:00 p.m.   Total Marks: 70

Q.1 Answer the following MCQs with correct option (Each of One Mark).   **(10)**

1. 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

2. In an optical system , there are .... principal points.

   (a) no (b) one (c) two (d) three

3. Which of these is an image forming device made of glass and bounded by two regular curved surfaces.

   (a) lens (b) prism (c) biprism (d) mirror

4. Which law states that a reflected beam is completely polarized when the angle of incident is equal to polarizing angle.

   (a) Hooke's law (b) Brewster's law (c) Maxwell's law (d) Newton's law

5. In a doubly refracting material,the ray which obey the Snell's law of reflection is known as ....

   (a) Ordinary Ray (b) Transmitted Ray (c) Incident Ray (d) Extra Ordinary Ray

6. When interference is due to division of amplitude method, the .... of the pattern is poor.

   (a) intensity (b) linearity (c) straightness (d) curvature

7. In interference pattern the separation between any two consecutive fringes is known as ....

   (a) fringe displacement (b) fringe separation (c) fringe width (d) fringe shift

8. The Sun is a black body with the surface temperature .... K

   (a) 6000 (b) 7000 (c) 8000 (d) 9000

9. For a wave , the height of the crest from the mid-point is called ......

   (a) wave front (b) wavelength (c) amplitude (d) frequency

10. The Lambert's law for the intensity of radiation from a surface is given by I = ...

    (a) $I_0 \sin\theta$ (b) $I_0 \cot\theta$ (c) $I_0 \tan\theta$ (d) $I_0 \cos\theta$

Q-2 Answer any TEN questions in short (Each of two Mark)   **(20)**

1. Explain curvature of field.
2. State types of monochromatic aberrations.
3. Define spherical aberration.
4. Calculate the thickness of double refracting plate capable of producing a path difference of $\lambda/4$ between extra ordinary and ordinary waves. (Given $\lambda = 5890$ Å, $\mu_{e=} = 1.54$ and $\mu_{0=} 1.53.$)
5. Discuss about retarders.
6. State applications of Brewster's law.
7. Explain the concept of wavefront splitting in case of interference.
8. Explain in brief about the multiple reflections produced by a plane parallel film.
9. Compare the fringes produced by Biprism and Lloyd's mirror.
10. Enlist the first four stages of remote sensing system.
11. Give a brief introduction to remote sensing.
12. Define active remote sensing.   (P.T.O.)

Q-3 (a) Describe the construction of image using cardinal points and hence derive the Newton's formula for the focal length of lens system. **(05)**

(b) Explain nodal points and nodal planes and prove that nodal points are a pair of conjugate points on the axis having unit positive angular magnification. **(05)**

OR

Q-3 (a) Derive the formula for focal length ' f ' of a combination of two thin lenses having focal lengths 'f_1' and 'f_2' separated by a distance 'd'. **(05)**

(b) Write a note on methods of removal of spherical aberration. **(05)**

Q-4 (a) Write a note on Nicol prism and its working as polarizer and analyzer. **(05)**

(b) Write a note on quarter wave plate. **(05)**

OR

Q-4 (a) Discuss about the construction and working of Liquid Crystal Display. **(05)**

(b) What is linearly polarized light? Explain how it can be produced using refraction and scattering. **(05)**

Q-5 Describe the construction of biprism and explain the method of determination of wavelength of a monochromatic source using it. **(10)**

OR

Q-5 (a) Discuss the construction and working of Lloyd's mirror in detail. **(05)**

(b) Explain the formation of fringes in Fabry-Perot interferometer and etalon. **(05)**

Q-6 (a) Explain the multi-spectral concept of remote sensing. **(05)**

(b) What are remote sensors? Discuss the different types of resolutions provided by them. **(05)**

OR

Q-6 (a) Discuss the role of sun and atmosphere in remote sensing. **(05)**

Q-6 (b) Derive the equation for the velocity of electromagnetic radiation. **(05)**

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