AU–106

B.Sc. (Part-II) Semester-IV Examination
PHYSICS

Time : Three Hours]   [Maximum Marks : 80

Note :— (1) **ALL** questions are compulsory.

(2) Draw neat and well labelled diagrams wherever necessary.

1. (A) Fill in the blanks :   2

(i) For constructive interference the optical path difference is _____.

(ii) Incoming solar radiation reaching earth surface is called _____.

(iii) Propagation of light through a fibre core depends on the Phenomenon known as _____.

(iv) _____ pumping is used in Ruby Laser.

(B) Choose the correct alternatives :   2

(i) If N be the number of lines per inch, the grating element will be :

(a) 2.54/N   (b) N/2.54

(c) N   (d) 1/N

(ii) Half wave plate introduces a phase difference between o-rays and E-rays of :

(a) $\pi/2$ (b) π

(c) 2π (d) $3\pi/2$

(iii) A laser beam consists of :

(a) Light material particles   (b) Highly coherent photons

(c) Electrons   (d) Cosmic rays

(iv) If α is the acceptance angle, then numerical aperture is :

(a) $\cos \alpha$ (b) $\tan \alpha$

(c) $\text{cosec}\ \alpha$ (d) $\sin \alpha$

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(C) Answer in **one** sentence : 4

    (i)   What is resolving power of optical instrument ?

    (ii) What is double refraction ?

    (iii) What is hologram ?

    (iv) What is fuel cell ?

EITHER

2.   (A) Derive an expression for equivalent focal length of a co-axial lens system.   4

    (B) What is interference of light ? Explain the interference in thin films due to transmitted light.   6

    (C) In a Newton's rings experiment, the diameter of 10th dark ring due to wavelength 6000 Å in air is 0.5 cm. Find the radius of curvature of the lens.   2

OR

3.   (P) What is wedge shaped thin film ? Explain the interference in wedge shaped thin film.   6

    (Q) What are Newton's rings ? Determine the wavelength of monochromatic light by using Newton's rings.   6

EITHER

4.   (A) Distinguish between zone plate and convex lens.   4

    (B) What is zone plate ? Describe its construction and deduce an expression for area of zone.   6

    (C) Explain the construction of Fresnel half period zone.   2

OR

5.   (P) Explain the Rayleigh's criteria for resolution.   4

    (Q) Derive an expression for the resolving power of a plane transmission grating.   6

    (R) A grating with 3000 lines per cm is illuminated at normal incidence by light of wavelength 6600 Å. How many orders will be visible ?   2

EITHER

6. (A) Explain the concept of polarization of light. 2

   (B) Explain polarization by reflection and derive Brewster's law. 6

   (C) What is Nicol Prism ? Describe its construction. 4

OR

7. (P) What is Phase retardation plate ? Derive an expression for thickness of quarter waveplate. 6

   (Q) Explain plane, circularly and elliptically polarised light. 6

EITHER

8. (A) Explain the term population inversion. 2

   (B) Describe three level laser system. 4

   (C) Describe construction and working of He-Ne Laser. 6

OR

9. (P) Explain the terms : 4

   (i) Stimulated emission

   (ii) Spontaneous emission.

   (Q) Explain construction and working of Ruby Laser. 6

   (R) Give any four applications of LASER. 2

EITHER

10. (A) Explain the term, 'Total Internal Reflection' and derive an expression for critical angle. 6

    (B) Classify the fibers on the basis of Refractive index and mode. 4

    (C) Calculate the numerical aperture and acceptance angle of an optical fibre from the following data :

    μ_1 (core) = 1.55 and μ_2 (cladding) = 1.50. 2

OR

11. (P) Derive an expression for acceptance angle of an optical fibre.   4

    (Q) What are different types of losses in optical fibre ?   3

    (R) State any two applications of optical fibre.   2

    (S) Explain fiber optical communication system.   3

EITHER

12. (A) Explain the concept of Photovoltaic cell.   2

    (B) Give the construction and working of Photovoltaic cell.   5

    (C) State the advantages of Photovoltaic cell.   2

    (D) Plot the graph between voltage and current in case of solar cell with proper naming.   3

OR

13. (P) Explain the focussing type solar collectors.   6

    (Q) Explain the construction and working of a solar cell.   3

    (R) State the applications of solar cell.   3