



IV Semester B.Sc. Examination, June 2009

(Semester Scheme)

PHYSICS – IV

Acoustics, Optics and Lasers

Time : 3 Hours

Max. Marks : 60

PART – A.

Answer **any five** of the following questions : (5×6=30)

1. Derive an expression for velocity of sound in a rod. Write the expression for velocity of sound in an extended solid. (5+1)
2. State and explain Fermat's principle. Deduce Snell's law of refraction using Fermat's principle. 6
3. What is a biprism ? Arrive at the conditions for bright and dark fringes in case of a biprism and show that the fringes are of equal width. (1+5)
4. Describe Newton's ring experiment to determine the wavelength of light used. 6
5. Distinguish between zone plate and convex lens. Obtain the expression for focal length of a zone plate. (3+3)
6. Explain Fresnel's diffraction at straight edge and obtain the conditions for secondary maxima and minima. 6
7. Explain Laurentz's half-shade - polarimeter to determine optical rotation of an optically active solution. 6
8. With a neat diagram explain He-Ne laser. 6

P.T.O.



PART - B

Answer any four of the following :

(4×5=20)

9. A man standing between two parallel cliff's fires a rifle. He hears one echo after 1.5 s another after 2.5 s. If the distance between the two cliff's is 700 m, find the velocity of sound and the distance of the man from one of the cliff's.
10. In a Kundt's tube experiment to determine the velocity of sound in a rod, the length of the rod used was 1.5 m. The distance between the two heaps of powder was found to be 0.1 m, in the glass tube. Calculate the velocity of sound in the rod . Given velocity of sound in air is 330 ms^{-1} .
11. A screen is placed 1 m away from a pair of coherent sources separated by a distance of $2 \times 10^{-4} \text{ m}$. Calculate the distance of the fifth bright fringe from the central fringe, if the wavelength of light used is $6 \times 10^{-7} \text{ m}$.
12. Interference fringes are produced with monochromatic light falling normally on a wedge shaped film of air. The angle of the wedge is 20 seconds of an arc and the distance between successive fringes is 0.25 cm. Calculate the wavelength of light used.
13. Calculate the minimum number of lines per cm in a 2.5 cm wide grating which will just resolve the sodium lines of wavelengths 5890 \AA and 5896 \AA , in the second order spectrum.
14. A crystal plate produces an optical path difference of 1500 \AA between the ordinary and the extraordinary vibrations. Calculate the thickness of the plate given $n_o = 1.544$ and $n_e = 1.554$.



PART - C

15. Answer any five of the following questions : (5×2=10)

- a) Why, on a hot day, the sound produced at a point is not clearly heard by an observer standing close to the point ? Explain.
 - b) Why does thunder heard after seeing the flash of lightening ?
 - c) Why do the fringes in Young's double-slit experiment become indistinct. If one of the slits is covered with a cellophane ? -
 - d) Why is, the centre of Newton's ring pattern in the reflected system, dark ?
 - e) What are half-period elements ? Why are they called so ?
 - f) How does the resolving power of a grating vary on increasing the number of rulings on grating ? Explain.
 - g) Light waves can be polarised but not sound waves. Explain.
 - h) What is the principle underlying holography ?
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