(b) Determine the velocity of a meter stick which appears to be 0.99 m to an observer on ground.   [5]

Section – C

Q-5. (a) Give the theory of plane transmission grating. Explain the missing orders in the spectrum.   [15]

(b) What is dispersive power of a grating? Derive an expression for it.   [5]

Q-6. (a) Define specific rotation. Describe the construction and working of Lorentz half shade polarimeter.   [10]

(b) Write note on:

(i) Double refraction

(ii) Nicol prism   [10]

Q-7. (a) What are the differences between spontaneous and stimulated emission? Describe the working of a Ruby laser.   [12]

(b) Give the principle of optical fibre. What do you mean by single mode and multimode fibres? Explain clearly.   [8]

Q-8. (a) What are ultrasonic waves? Describe the Piezoelectric method for producing ultrasonic waves.   [10]

(b) How are ultrasonic waves detected?   [5]

(c) Ultrasonic pulse echo method is employed to detect possible defect in steel bar of thickness 40 cm. If pulse arrival times are 30 µs and 80 µs, find the distance of the defect.   [5]

Lingaya's University
B.Tech 1ˢᵗ Year (Term – III)
Examination – May 2011
Physics (PH - 101)

[Time: 3 Hours]   **[Max. Marks: 100]**

Before answering the question, candidate should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note: – Attempt five questions in all. All questions carry equal marks. Question no. 1 (Section A) is compulsory. Select two questions from Section B and two questions from Section C.

Section – A

Q-1. Part – A

Select the correct answer of the following multiple choice questions.   [10×1=10]

(i) In Fresnel's biprism experiment the distance between the slits is gradually increased. The fringe width of the system

(a) Increases   (b) Decreases

(c) Remains unchanged   (d) Fringe pattern disappears

(ii) Newton's rings are

(a) Locus of points of equal thickness

(b) Locus of points of equal inclination

(c) Locus of points of equal thickness and of equal inclination

(d) Neither (a) nor (b)

(iii) If N is the total no. of rulings on a grating, n is the order of spectrum and λ is the wavelength of light used, then resolving power of a grating is given by

(a) N$n\lambda$ (b) Nn (c) $N\lambda/n$ (d) N/n

(iv) When unpolased light enters a doubly refracting crystal, we get two refracted rays called ordinary 0 – rays and extra ordinary E – ray. Which of the following statement is true?

(a) Only O – ray is polarized

(b) Only E – ray is polarized

(c) Both O – ray and E – ray are polarized

(d) Neither O – ray nor E – ray is polarized

(v) The pointing vector $\vec{S}$ of an electromagnetic wave is:

(a) $\vec{S} = \vec{E} \times \vec{H}$ (b) $\vec{S} = \vec{E} \times \vec{B}$

(c) $\vec{S} = \vec{E}/\vec{B}$ (d) $\vec{S} = \vec{E}/\vec{H}$

(vi) In electromagnetic wave the phase difference between electric and magnetic field vectors $\vec{E}$ and $\vec{B}$ is:

(a) 0 (b) $\pi / 2$ (c) π (d) $\pi / 4$

(vii) The relation between dielectric constant K and electric susceptibility χ_e is:

(a) $K = 1 + \epsilon_0 \chi_e$ (b) $K = 1 - \chi_e$

(c) $K = 1 + \chi_e$ (d) $K = \epsilon_0 \chi_e$

(viii) Two waves of equal amplitude and wavelength but differing in phase are superimposed. Amplitude of the resulting wave is maximum, when phase difference is

(a) $\pi / 2$ (b) $3\pi / 2$ (c) 2π (d) π

(ix) The power of an optical instrument by which it can form separate images of two close objects is called

(a) Dispersive power (b) Magnifying power

(c) Resolving power (d) Diopter

(x) The function of H_e atoms in H_e-N_e laser is

(a) To quench the neon atoms

(b) To provide energy to the neon atoms

(c) To make neon atoms inactive

(d) None of the above

Q-1. Part – B

(a) Differentiate between Fraunhofer and Fresnel diffraction. [5]

(b) Discuss behaviour of dielectrics in A.C. field. [5]

Section – B

Q-2. (a) Describe and explain the formation of Newton's rings in reflected monochromatic light. Show that the diameters of dark rings are proportional to the square root of natural numbers. [15]

(b) Interference fringes are produced using a bi-prism illuminated by the two virtual sources separated by a distance of 0.75 mm. If the screen is placed at a distance of 1.2 m from the source, find the wavelength of the light used if the distance of the 20th bright fringe from the centre is 1.888 cm. [5]

Q-3. (a) Establish the Maxwell's equations in a conducting medium and thereby prove their transverse nature. [15]

(b) State and prove Gauss law in dielectrics. [5]

Q-4. (a) Describe the Michelson-Morley experiment in detail. How were its negative results interpreted? [15]