

- (c) What do you understand by double refraction? Discuss in brief the double refraction through a Nicol prism and explain how polarized light will be obtained using it. [10]

Q-6. (a) Write short notes on (i) length contraction, (ii) energy-mass equivalence. [12]

- (b) A rod lies parallel to the x-axis of reference frame S moving along this axis at a speed of 0.63 c. Its rest length is 1.70 m. What will be its measured length in frame S? [4]

- (c) A stationary body breaks into two fragments of rest mass 1.0 kg each that move apart at speed 0.6 c relative to the original body. Find the rest mass of the original body. [4]

Q-7. (a) Obtain the expressions for (i) dispersive power and (ii) resolving power of a transmission diffraction grating. [10]

- (b) What is the least number of rulings a grating can have and still be able to resolve the sodium doublet ($\lambda_1 = 589.0$ nm and $\lambda_2 = 589.6$ nm) in first order? [5]

- (c) Describe the diffraction through a single slit. [5]

Q-8. (a) Describe the construction and working of a Fresnel's Biprism. [10]

- (b) Find the resultant of the following two waves:

$$y_1 = 10 \sin \omega t$$

$$y_2 = 8.0 \sin (\omega t + 30^\circ) \quad [5]$$

- (c) We wish to coat flat glass ($n=1.50$) with a transparent material ($n = 1.25$) so that reflection of light at wavelength 600 nm is eliminated by interference. What minimum thickness can the coating have to do this? [5]

Roll No.

Lingaya's University
B.Tech. 1st Year (Term – II)
Examination – Feb 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 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. [10x1=10]

- (i) The diameters of bright Newton's rings is proportional to

(a) $\sqrt{\text{Odd Natural Numbers}}$

(b) $\sqrt{\text{Even Natural Numbers}}$

(c) $\sqrt{\text{Prime Numbers}}$

(d) $\sqrt{\text{Natural Numbers}}$

- (ii) In Michelson interferometer, circular fringes will be observed when mirrors M_1 and M_2 are _____ to each other

(a) Perpendicular

(b) Parallel

(c) 45°

(d) 60°

- (iii) In the grating, if we increase the total number of slits, the width of principal maximum
 (a) increases only (b) decreases only
 (c) no change
 (d) may sometimes increase or decrease
- (iv) The following orders spectra will be absent in the grating spectrum, if $a=b$, where a is opacity width & b is transparency width
 (a) 1, 3, 5, (b) 2, 4, 6,
 (c) 1, 2, 3, (d) none
- (v) The polarized light ray coming out from Nicol prism is
 (a) O-ray (b) E-ray
 (c) Combination of O-ray & E-ray (d) None
- (vi) In fiber optic cables, the following condition is fulfilled
 (a) $\mu_{\text{core}} > \mu_{\text{cladding}}$ only (b) $\mu_{\text{cladding}} > \mu_{\text{core}}$ only
 (c) $\mu_{\text{core}} = \mu_{\text{cladding}}$ (d) may be either (b) or (c)
- (vii) Maxwell's first equation is
 (a) $\nabla \cdot B = \rho$ (b) $\nabla \cdot D = \rho$
 (c) $\nabla \cdot H = \rho$ (d) $\nabla \cdot E = \rho$
- (viii) Poynting vector has the units of
 (a) electric flux (b) magnetic flux
 (c) energy flux (d) electric field
- (ix) Which of the following is correct
 (a) $D = \epsilon_0 E + P$ (b) $\epsilon_0 E = D + P$
 (c) $P = \epsilon_0 E + D$ (d) $D/P = \epsilon_0 E$
- (x) The frequency of ultrasonic waves is
 (a) $> 20,000$ Hz (b) $< 20,000$ Hz
 (c) 20 Hz only (d) < 20 Hz

Part – B

- (a) Calculate the speed of a particle when its total energy is equal to twice its rest energy. [4]
 (b) Enunciate the Rayleigh's criterion for resolvability. [3]
 (c) What is displacement current? How is it different from the conventional current? [3]

Section – B

- Q-2. (a) Define Poynting vector (**S**). Derive an expression for it. [8]
 (b) Define electric susceptibility and permittivity. Set up equation that relates the two. [5]
 (c) State and prove Gauss' law in dielectrics. [7]
- Q-3. (a) What are ultrasonic waves? Give their main properties. Discuss two methods for its detection. [14]
 (b) Describe some of important applications of ultrasonic waves. [6]
- Q-4. (a) Describe in details the principle, construction & working of a Ruby laser. [15]
 (b) What are single mode and multimode optical fibers? [5]

Section – C

- Q-5. (a) Describe the polarization of electromagnetic waves by reflection. [5]
 (b) Light traveling in water of refractive index 1.33 is incident on a glass plate of refractive index 1.53. At what angle of incidence is the reflected light fully polarized? [5]