

5 Do any four of the following : 5×4=20

- (a) Discuss the diffraction of X-rays and Bragg's law. Describe also functioning of a Bragg Spectrometer.
- (b) What are modified and unmodified radiation in Compton scattering? How Compton explained unmodified radiation? How Compton effect is measured?
- (c) A proton is moving with a speed of 2×10^8 m/s. Find the wavelength of matter wave associated with it.
- (d) State and give physical meaning of Heisenberg's uncertainty principle.
- (e) What is physical significance of wavefunction ψ used in time independent Schrodinger wave equation?
- (f) A particle is moving in one dimensional potential box of width 25 \AA . Calculate the probability of finding the particle within an interval of 5 \AA at the centre of the box when it is in its state of least energy.

Physical constants :

Planck's constant $h = 6.63 \times 10^{-34}$ J.s

Velocity of light in free space $C = 3 \times 10^8$ m/s

Electronic charge $e = 1.6 \times 10^{-19}$ C

Permittivity of free space $G_0 = 8.85 \times 10^{-12}$ F/m

Permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ H/m

Rest mass of electron $m_e = 9.1 \times 10^{-31}$ kg

Mass of proton $m_p = 1.67 \times 10^{-27}$ kg.



Printed Pages : 4

TAS101

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9913

Roll No.

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B.Tech

(SEM I) ODD SEMESTER THEORY EXAMINATION 2009-10
PHYSICS

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt all questions.
 - (2) All questions carry equal marks.
 - (3) Standard data are given in the end of the question paper.

1 Do any four of the following : 5×4=20

- (a) Discuss briefly Michelson-Morley experiment and mention its outcome.
- (b) Deduce an expression for time dialation on the basis of Lorentz transformation equations.
- (c) Obtain the volume of a cube, the proper length of each edge of which is L_0 , when it is moving with velocity v along one of its edges.
- (d) How fast an electron must move in order that its mass equal to the rest mass of the proton?
- (e) Show that the relativistic form of Newton's second law when \vec{F} is parallel to \vec{v} is

$$\vec{F} = m_0 \frac{dv}{dt} \left[1 - \frac{v^2}{c^2} \right]^{\frac{3}{2}}$$

- (f) If the kinetic energy of a body is twice of its rest mass energy, find its velocity.



2 Do any four of the following : 5×4=20

- (a) What do you understand by coherent sources? How are these obtained in practice? Give examples.
- (b) Explain that in biprism expt. the central fringe is achromatic when white light is used.
- (c) Light of wavelength 6000 \AA is incident normally on a wedge shaped film ($\mu = 1.35$). The fringes are formed to be 2.0 mm apart from each other. Calculate the angle of wedge.
- (d) What is meant by diffraction of light? Distinguish between Fresnel and Fraunhofer class of diffraction giving examples.
- (e) Calculate the angle between the central image of a lamp filament and its first diffracted image produced by a fabric with 160 threads per cm ($\lambda = 6000 \text{ \AA}$).
- (f) Obtain the design of a plane transmission diffraction grating capable of resolving a wavelength difference of 6 \AA at a mean wavelength of 6000 \AA in second order spectra.

3 Do any two of the following : 10×2=20

- (a) What do you understand by double refraction? Explain Huygens theory of double refraction in an uniaxial crystal.

- (b) (i) Calculate the thickness of a doubly refracting crystal plate required to introduce a path difference of $\frac{\lambda}{2}$ between the ordinary and extraordinary rays when $\lambda = 6000 \text{ \AA}$, $\mu_o = 1.55$ and $\mu_e = 1.54$.
- (ii) The specific rotation of quartz at 5086 \AA is 29.73 deg/mm. Calculate the difference in the refractive indices.
- (c) What are the requirements for producing laser action? How are they achieved?

4 Do any two of the following : 10×2=20

- (a) Explain the concept of Maxwell's displacement current and show how it led to the modification of the Ampere's law.
- (b) (i) What is Poynting vector? If the electric amplitude of the wave is 5 V/m , what is the magnetic amplitude of this wave?
- (ii) Write four Maxwell's equation in conducting medium and derive wave equation.
- (c) (i) A material has 10 turns per cm of wire wound uniformly upon it which carries a current of 2.0 amp. The flux density in the material is 1.0 Weber/m^2 . Calculate the magnetising force and magnetisation of the material.
- (ii) What is meant by Hysteresis and Hysteresis curve? How would you use the hysteresis curves to select the material for construction of permanent magnet.