

Total No. of Questions : 6]

[Total No. of Printed Pages : 3

[3861]-153

F. E. (Semester - I) Examination - 2010

APPLIED SCIENCE - I

(PHYSICS)

(2008 Pattern)

Time : 2 Hours]

[Max. Marks : 50

*Instructions :*

- (1) Answer 3 questions.
- (2) Black figures to the right indicate full marks.
- (3) Neat diagrams must be drawn wherever necessary.
- (4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (5) Assume suitable data, if necessary.

---

**Constants :**  $h = 6.63 \times 10^{-34}$  J.Sec.

$$m = 9.1 \times 10^{-31} \text{ kg}$$

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

$$C = 3 \times 10^8 \text{ m/sec.}$$

- Q.1)** (A) Draw a neat labelled diagram of Michelson's Interferometer and explain how it is used to determine thickness of a thin transparent plate ? [07]
- (B) Derive equation of a displacement produced by an electron when it passes through perpendicular electric field. [06]
- (C) The electric field between the plates of the velocity selector in a Bainbridge Mass Spectrograph is 1200 V/cm. and the magnetic field in both regions is 0.6 wb/m<sup>2</sup>. A stream of singly charged neons moves in circular path of radius 7.28 cm. in magnetic field. Determine mass number of the isotope.  
(Given : Avagadro Number =  $6.02 \times 10^{26}$ /kgmole,  
 $e = 1.6 \times 10^{-19}$  C.) [04]

OR

- Q.2)** (A) In magnetostatic focusing explain motion of electron when it travels in a direction inclined at an angle  $\theta$  with the direction of magnetic field. Show construction of magnetic lens. [07]
- (B) Prove that for Newton's Rings in reflected light the diameters of dark rings are proportional to square root of natural number. [06]
- (C) A parallel beam of light of wavelength  $5890 \text{ \AA}$  is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction into the plate is  $60^\circ$ . Calculate smallest thickness of a glass plate which will appear dark in reflected light. [04]
- Q.3)** (A) Derive equation of resultant intensity of light waves in the Fraunhofer's diffraction at a single slit. [06]
- (B) Explain any two applications of Ultrasonic Waves. [06]
- (C) When the Parallel Waves of Monochromatic Light of Wavelength  $5790 \text{ \AA}$  fall normally on a grating  $2.54 \text{ cm}$  wide. The first order spectrum is produced at an angle of  $19.994^\circ$  from the normal. Calculate total number of lines of the grating. [04]

**OR**

- Q.4)** (A) Explain Magnetostriction Oscillator for production of Ultrasonic Waves. [06]
- (B) What is Resolving Power of Grating. Obtain an expression for it. [06]
- (C) A slit of width  $0.16 \text{ mm}$  is illuminated by a monochromatic light of wavelength  $5600 \text{ \AA}$ . Find half angular width of a principal maximum. [04]
- Q.5)** (A) What is Nuclear Fusion ? Explain Proton-Proton and Carbon-Nitrogen Cycle of Fusion Reaction. [07]
- (B) Which are different methods of production of plane polarized light ? Describe process of production and detection of elliptically polarized light. [06]
- (C) In a Betatron, having operating frequency of  $50 \text{ Hz}$ , the maximum magnetic field traversing the electron orbit of radius  $0.8 \text{ m}$  is  $0.8 \text{ wb/m}^2$ . Calculate Final Energy and Average Energy gained per revolution, assuming maximum possible time for acceleration.  
(Given :  $C = 3 \times 10^8 \text{ m/s}$ ,  $e = 1.6 \times 10^{-19} \text{ C}$ ) [04]

**OR**

- Q.6)** (A) Explain principle, construction and working of Cyclotron and show that the period of revolution is independent of Velocity of Particle. [07]
- (B) Explain Huygen's Theory of Double Refraction. [06]
- (C) Calculate thickness of a mica plate required to make a Quarter Wave Plate and a Half Wave Plate for light of wavelength  $5890 \text{ \AA}$ . (Given :  $\mu_o = 1.586$  and  $\mu_e = 1.592$ ) [04]
-