Total No. of Questions : 6] [Total No. of Printed Pages : 3

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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.
$m = 9.1 \times 10^{-31}$ kg.
$e = 1.6 \times 10^{-19}$ C
$C = 3 \times 10^{8}$ 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^2. 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 = 6.02×10^{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 θ 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 A° is incident on a thin glass plate of refractive index 1.5 such that the angle of refraction into the plate is 60°. 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 Fraunhoffer'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 A° fall normally on a grating 2.54 cm wide. The first order spectrum is produced at an angle of 19.994° 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 0.10 mm is illuminated by a monochromatic light of wavelength 5600 A°. 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) What 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 Hz, the maximum magnetic field traversing the electron orbit of radius 0.8 m. is 0.8 wb/m^2. Calculate Final Energy and Average Energy gained per revolution, assuming maximum possible time for acceleration.

(Given : C = 3×10^8 m/s, e = 1.6×10^{-19} 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 A°. (Given : $\mu_0 = 1.586$ and $\mu_e = 1.592$) **[04]**
