Seat No.	

F.E. (Semester – I) Examination, 2012
APPLIED SCIENCE – I
Physics
(2008 Pattern)

Time : 2 Hours

Max. Marks : 50

Instructions: 1) *Answer Q.* ***1*** *or Q.* ***2***, *Q.* ***3*** *or Q.* ***4***, *Q.* ***5*** *or Q.* ***6***.

       2) *Neat diagrams must be drawn* ***wherever*** *necessary.*

       3) *Black figures to the* ***right*** *indicate* ***full*** *marks.*

       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.

             $c = 3 \times 10^{8}$ m/s

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

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

1. A) Deduce an expression for the displacement produced when an electric field acts perpendicular to electron motion. What is deflection sensitivity ? Give an expression for the deflection sensitivity in this case. **7**

   B) Draw a neat labelled diagram of Michelson's interferrometer and explain with necessary theory how it can be used to measure the wavelength of monochromatic light. **6**

   C) A wedge shaped air film having an angle of 40 seconds is illuminated by monochromatic light and fringes in reflected system are observed through a microscope. The distance between consecutive bright fringes was measured as 0.12 cm. Calculate the wavelength of light. **4**

OR

2. A) Draw a neat labelled diagram showing interference of light in a transparent thin film of uniform thickness. Write down only the conditions for maximum and minimum intensity of light in reflected system. Explain the use of thin film as antireflecting coating. **7**

   B) Explain the principle, construction and working of Bain bridge mass spectrograph with neat diagram. **6**

   C) In Newton's ring experiment, the diameter of 15th dark ring was found to be 0.590 cm and that of 5th dark ring was 0.336 cm. If the radius of curvature of plano convex lens is 100 cm, calculate the wavelength of light used. **4**

3. A) Give the theory of plane transmission grating. Obtain the conditions for maxima and minima. **7**

   B) What is piezo-electric effect ? Draw a neat diagram and explain the working of piezoelectric generator for the production of ultrasonic waves. **6**

   C) A slit of width $2\,\mu m$ is illuminated by light of wavelength 6500A°. Calculate the angle at which the first minimum will be observed. **4**

OR

4. A) State Rayleigh's criterion of resolution. Hence deduce an expression for resolving power of grating. **7**

   B) Explain echo sounding technique. Discuss any two applications of ultrasonics based on this technique. **6**

   C) Monochromatic light from laser of wavelength 6238A° is incident normally on a diffraction grating containing 6000 lines/cm. Find the angles at which the first and second order maximum are obtained. **4**

5. A) What is double refraction ? Explain it on the basis of Huygen's wave theory. **6**

   B) With a neat labelled diagram, explain the construction and working of betatron. Obtain the betatron condition. **6**

   C) Calculate the thickness of doubly refracting crystal required to introduce a phase difference of π radians between O and E rays. Given that $\lambda = 6000A°$, $\mu_0 = 1.55, \mu_e = 1.54$. **4**

   OR

6. A) What is nuclear fusion ? Give an account of proton-proton cycle as the cause of stellar energy. **6**

   B) What are retardation plates ? What are their types ? Obtain expression for their thickness. **6**

   C) If the frequency of oscillator applied to the dees of cyclotron is 9 MHz, what must be the magnetic flux density to accelerate α-particles ?

   Given : $m_\alpha = 6.643 \times 10^{-27}$ kg $q_\alpha = 3.2 \times 10^{-19}$ c. **4**

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