May - June - 2011

[3961] – 103

F.E. (Semester – I) Examination, 2011
APPLIED SCIENCE – I
(Physics) (2008 Pattern)

Time : 2 Hours Max. Marks : 50

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

1. a) Obtain the equation of path difference between the reflected rays when the monochromatic light is incident on the uniform thickness film. Give the conditions of minimum and maximum. **7**

   b) Explain refraction of electron when it travels from low potential region to high potential region and explain electrostatic lens. **6**

   c) When a thin transparent plate of thickness 6.3×10^{-4} cm is introduced in the path of one of the interfering rays of Michelson's interferometer then a central bright fringe shifts to a position previously occupied by 6^{th} bright fringe. If the wavelength of light is 5460 A°, find the refractive index of the plate. **4**

OR

2. a) Explain construction and working of Bainbridge mass spectrograph and prove that different isotopes follow a circular path of different radius. **7**

   b) In Newton's ring's experiment, show that the diameters of dark rings are proportional to square root of natural numbers. **6**

   c) An electron accelerated from rest through a potential difference of 900 V, enters a uniform perpendicular magnetic field of flux density 0.01 Tesla. Determine the linear velocity of electron and radius of circular path followed by electron in mag. field. Given $m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C. **4**

3. a) With the help of circuit diagram explain how magneto-striction effect is used in oscillator circuit to generate ultrasonic waves. **6**

   b) What is diffraction grating ? Give the equation of resultant intensity of light with the meaning of each symbol, when monochromatic light is diffracted from grating. Obtain the equation of maxima and minima. **6**

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c) A single slit Fraunhoffer's diffraction pattern is formed using white light. For what wavelength of light does the second minimum will coincide with third minimum of light of wavelength 4000 A°. **4**

OR

4. a) What is diffraction of light ? What are the types of diffraction ? Distinguish between them. **6**

b) Explain echo sounding and cavitation techniques as an application of ultrasonic waves. **6**

c) A grating has 6000 lines per cm. If the monochromatic light of wavelength 4500 A° is diffracted from it, how many orders can be seen ? If another grating having 7000 lines per cm is used, what is the effect on number of order seen ? **4**

5. a) What is polarization by double refraction ? Explain it on the basis of Huygen's theory. What is positive and negative crystals ? **7**

b) What is nuclear chain reaction in fission ? Why it is not possible in natural uranium ? Discuss how it is made possible. **6**

c) The protons in a cyclotron describes a circular path of radius 0.4 m just before emerging from the dees. If the magnetic flux density is 1.5 Tesla, what is the maximum kinetic energy of protons and frequency of applied AC voltage between the dees ?

(Given : $m_p = 1.67 \times 10^{-27}$ kg)
$q = 1.6 \times 10^{-19}$C **4**

OR

6. a) Explain principle, construction and working of Betatron and derive the equation of Betatron condition. **7**

b) Explain how to analyze the given beam of light as a unpolarized, plane, elliptically ,circularly and partially polarized with the help of Nicol prism and quarter wave plate. **6**

c) A retardation plate of thickness 2.275×10^{-3} cm is cut with its faces parallel to optic axis. If the emergent beam of light is elliptically polarized find the wavelength of monochromatic light incident normally on it.

(Given $\mu_o = 1.586, \mu_e = 1.592$). **4**