



**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.*

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

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

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

*$c = 3 \times 10^8$  m/Sec.*

1. A) Explain with diagram and necessary theory how Newton's rings can be obtained in the laboratory ? Why in Newton's Ring centre is always dark for reflected system. 7
- B) Explain by drawing suitable diagrams the focusing action of a symmetrical electron lens. 6
- C) A soap film of  $\mu = \frac{4}{3}$  and of thickness  $1.5 \times 10^{-4}$  cm. is illuminated by white light incident at an angle of  $45^\circ$ . The light reflected by it is examined by a spectroscope in which it is found a dark band corresponding to wavelength of  $5000 \text{ \AA}$ . Calculate the order of interference band. 4

OR

2. A) Derive an expression for path difference in reflected light for thin parallel film and show that the interference pattern in the reflected and transmitted system is complimentary. 7
- B) Explain with neat diagram the principle, construction and working of Bain Bridge Mass spectrograph. 6
- C) When the movable mirror of Michelsons interferometer is shifted through  $0.0589 \text{ mm}$ , 200 fringes move across the field. Calculate the wavelength of light used. 4



3. A) What is diffraction grating ? Obtain the condition for the formation of principle maxima and minima in grating. 6
- B) What are Ultrasonics ? What are different methods of their production ? Explain any one method with suitable diagram. 6
- C) Find the half angular width of the central maxima in the Fraunhofer diffraction pattern of a slit of width  $12 \times 10^{-5}$  cm, when illuminated by light of wavelength  $6000 \text{ \AA}$ . 4

OR

4. A) With necessary theory show that the central maxima lies at  $\theta = 0$  in Fraunhofer diffraction by a single slit. 6
- B) Explain any one application of Ultrasonics. Calculate a length of iron rod which can be used to produce Ultrasonic wave of 20 KHz. (Given-Density of iron  $7.23 \times 10^3 \text{ kg/m}^3$  and  $Y = 11.6 \times 10^{10} \text{ N/m}^2$ ). 6
- C) Explain : 4
- i) Diffraction
  - ii) Resolving power.
5. A) Explain the term Dichroism. What are Polaroids and how are they produced ? 6
- B) Explaining the working of a Cyclotron show that the final energy acquired by the particle does not depend on the voltage applied across the Dee's. 7
- C) In a 70 MeV Betatron, the radius of the stable electron orbit is 28 cm. Find the value of magnetic field B at the orbit for the given energy. 4

OR

6. A) Explain Nuclear Fusion. Give an account of Carbon Nitrogen cycle in Fusion reaction. 6
- B) Using Huygens principle, construct refracted beams in calcite crystal when : 6
- i) Optic axis in the plane of incidence and parallel to the crystal surface.
  - ii) Optic axis in the plane of incidence and perpendicular to crystal surface.
  - iii) Optic axis in the plane of incidence and inclined to crystal surface.
- C) What is law of Malus ? Polarizer and analyser are set with their polarizing angle parallel, so that the intensity of transmitted light is maximum. Through what angle should either be turned so that the intensity be reduced to 50% and 25% of the maximum intensity. 5