

F.E. (Semester - I)
APPLIED SCIENCE - I (Physics)
(2008 Course)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *You are advised to attempt not more than questions.*
- 4) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Constants :

Velocity of light (c) = 3×10^8 m/sec.

Mass of electron (m) = 9.1×10^{-31} kg

Charge on electron (e) = 1.6×10^{-19} C

Planck's constant (h) = 6.625×10^{-34} J-s

- Q1)** a) Derive an expression for path difference in reflected light from uniform thin film. Give the condition for constructive and destructive interference for transmitted system. [7]
- b) Obtain an expression for the motion of an electron in a perpendicular electric field. [6]
- c) Fringes of equal thickness are observed in a thin glass wedge of refractive index 1.52. The fringe spacing is 1 mm and the wavelength of light is 5893Å. Calculate the angle of the wedge in seconds of an arc. [4]

OR

- Q2)** a) How can Newton's rings be obtained in the laboratory? Show that the diameter of n^{th} dark ring is directly proportional to square root of natural number. [6]
- b) Explain how an electron beam can be made to bend either towards or away from the normal to an equipotential surface. How does an electrostatic lens focus electrons? [7]
- c) An electron accelerated by potential difference of 5000 V enters a magnetic field of 0.01 wb/m² perpendicular to its direction of motion. Determine the radius of the path of electrons. [4]

P.T.O.

- Q3)** a) Obtain the expression for intensity in fraunhofer diffraction due to single slit. [7]
- b) Explain the principle of :- [6]
- Magnetostriction effect.
 - Piezo - electric effect.
- c) What is the longest wavelength that can be observed in the third order for a transmission grating having 7000 lines per cm. Assume normal incidence. [4]

OR

- Q4)** a) What are Ultrasonics? Explain :- [7]
- Echo sounding technique with one application.
 - Cavitation with one application.
- b) Explain Rayleigh's criterion of resolution obtain an expression for the resolving power of grating. [6]
- c) Calculate the natural frequency of a quartz crystal of thickness 2 mm :
Given : - Density of crystal = 2650 kg/m²
Young's modulus = 8×10^{10} N/m² [4]

- Q5)** a) Define plane of polarisation and plane of vibration. Explain how plane polarised light can be obtained by reflection. [6]
- b) Explain the principle, construction and working of betatron. [6]
- c) Explain giving diagrams the nature of refraction observed in the case of calcite crystal when : [4]
- Optic axis parallel to the refracting surface and lying in the plane of incidence.
 - Optic axis perpendicular to the refracting surface and lying in the plane of incidence.

OR

- Q6)** a) Distinguish between nuclear fission and fusion. Explain the chain reaction in natural uranium. [6]
- b) What do you understand by retardation plates? Derive an expression for quarter wave plate and half wave plate for quartz crystal. [6]
- c) A cyclotron with a dee radius of 50 cm is used to accelerate deuterons. The frequency of the Oscillator is 2 MHz. Calculate their energy as they emerge. Mass of deuteron = $2 \times 1.6 \times 10^{-27}$ kg
Charge of deuteron = 1.6×10^{-19} C. [4]

