B.E. (Engg. - I)

APPLIED SCIENCE - II (1997 Course)

(Time : 3 Hours) *(Max. Marks : 100)*

Instructions :

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn whenever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of calculator, tables, charts, Mollier charts, electronic pocket diary is allowed.*
6) *Assume suitable data, if necessary.*

Constants :

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

$h = 6.63 \times 10^{-34}$ J-sec.

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

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

SECTION - I

Q1) a) What are Newton's rings? Describe the formation of Newton's rings and hence explain how it is used to determine the wavelength of monochromatic source of light. [6]

b) What do you mean by double refraction? Explain positive and negative crystals. [6]

c) Electron and alpha particle both move in circular path in the same magnetic field with the same magnitude velocity. Compare the revolutions they make per second.

Mass of α particle = 6.68 x 10^{-27} kg. [4]

Q2) a) Explain

i) diffraction of light.

ii) dispersion by grating.

Also obtain an expression for dispersive power of grating. [6]

b) A thin crystal plate is cut with its faces parallel to optic axis. A beam of plane polarized light is made incident normally with direction of vibration inclined at an angle θ with optic axis of the plate. Discuss analytically the production of plane, elliptically and circularly polarized light. [6]

P.T.O.

c) When a beam of X-rays received by the cotton (black) is viewed at the scattering angle 45° the wavelength of modified scattered photons is found out to be 1.01 Å. Determine the momentum of X-ray photon undergoing unmodified scattering. [4]

Q3) a) Explain the construction and working of Ruby laser. [6]

b) Explain the Hunger's view-interior. [6]

c) Fringes of equal thickness are observed in a thin glass wedge of refractive index 1.52. The fringe spacing is 0.1 mm and wavelength of light is 5893 Å. Calculate the angle of wedge. [4]

Q4) a) What are ultrasonics waves? Explain magnetostriction oscillator for the production of ultrasonic waves. [6]

b) Explain how electron beam can be made to bend either towards or away from the perpendicular to an applied uniform surface. How does an electron behave when subjected to an applied uniform surface? [6]

c) A plane diffraction grating has 15,000 lines per inch. Find the angle of separation of the 5893 Å and 5915 Å lines of helium in the second order spectrum. [4]

Q5) Write short notes on (any three) : [18]

i) Nicol prism.

ii) Factors affecting architectural acoustics.

iii) Holography.

iv) Bainbridge Mass spectrograph.

v) Pulse optics technique.

SECTION - II

Q6) a) What are alloy steels? How are they superior to plain carbon steels? [6]

b) Give the nomenclature, properties and uses of Aluminium alloys (any three). [8]

c) Explain the mechanism of Addition polymerization. [4]

Q7) a) Explain how vulcanized rubber is superior to unvulcanized one? Distinguish between natural rubber and synthetic rubber. [6]

b) Give structure properties and applications of

i) Melamine formaldehyde resin

ii) Polyethylene. [6]

c) How do you classify the plastics on the basis of their thermal behaviour? Explain with suitable examples. [4]

Q8) a) Give the composition, properties and uses of

i) Emulsion paint

ii) Varnishes. [6]

b) Define refractory. Explain the general characteristics of refractories in detail. [6]

c) Define abrasive. State any three synthetic abrasives with their properties and applications. [4]

Q9) a) How is galvanic series better placed over electrochemical series? Explain galvanic corrosion with suitable example. [6]

b) Explain anodic protection method for corrosion control. Compare it with cathodic protection method. [6]

c) What is Parkerising? Give its properties and applications. [4]

Q10) Write short notes on (any three) : [18]

i) Au - Pt system.

ii) Purposes of alloy making.

iii) Classification of polymers.

iv) Normal theory and corrosive tendency of metals.

v) Automobile pollution control methods.