1078
B.E., First Semester
AS-102: Physics
(Common)

Time allowed: 3 Hours   Max. Marks: 50

NOTE: Attempt <u>five</u> questions in all, selecting atleast two questions from each Section.
x-x-x

Section A

Q.1 (a) What is meant by plane polarized, circularly polarized and elliptically polarized light? Show that plane polarized and circularly polarized lights are special cases of elliptically polarized light. (5)

(b) The critical angle of incidence for total reflection in case of water is 48°. What is its polarization angle? (2)

(c) How is hologram different from a photograph? What are various requirements to get a good quality hologram? (3)

Q.2 (a) Explain how light is propagated through an optical fiber and also determines the numerical aperture and acceptance angle. (4)

(b) Calculate the fractional index change for a given optical fiber if the rtefractive indices of the core and cladding are 1.563 and 1.498 respectively. (2)

(c) Discuss the construction and working of Ruby laser with proper energy level diagram. (4)

Q.3 (a) What is a black body? What are the salient features of blackbody radiation? (4)

(b) Light of wavelength 200 nm falls on a surface whose work function is 4 eV. Calculate the stopping potential. (2)

(c) What are matter waves? Why is the wave nature of matter not apparent to our daily observation? Also show that Heisenberg uncertainty principle is a consequence of matter waves. (4)

Q.4 (a) Derive the time dependent and time independent forms of Schrodinger wave equation. (5)

(b) By applying Schrodinger wave equation to a particle confined in 1-D rigid box, find out the wave functions and energy levels. (5)

Section B

Q.5 (a) Write a short note on elements of crystal symmetry. (4)

(b) Determine lattice constant for fcc lattice having atoms of radius 1.66 Å. Find out the spacing of (111) planes. (2)

(c) Explain how the dislocations help to improve the mechanical strength of materials. (4)

Q.6 (a) Explain the Kronig-Penney model of solids and show that it leads to the formation of energy bands. (5)

(b) Derive an expression for density of energy states and hence obtain Fermi energy of a metal. (5)

Q.7 (a) Derive Clausius Mossoti equation. (5)

(b) Write short notes on the following:

(i) Piezoelectricity

(ii) Ferrites (5)

Q.8 (a) How do you account for the magnetic properties of materials? Explain. Also give the complete classification of magnetic materials. (5)

(b) Explain the different factors which determine the structure in a ferromagnetic material. (5)

x-x-x