VCD 31022 S.Y.B.Sc. Sem-III Physics-III Hrs:3 Marks :100

Note: (1) All questions are compulsory.
(2) Figures to the right indicate maximum marks.
(3) Use of non-programmable calculators is permitted.
(4) Symbols used have their usual meaning.

Q.1. (A) Choose correct alternative in each of the following: (12)

(i) The unit of absorption coefficient of sound is

a) phon b) sone c) sobine d) watt/m^2

(ii) The refractive index of core of optical fiber is

a) Larger than that of cladding material
b) Smaller than that of cladding material
c) Equal to the refractive index of cladding material
d) None of these

(iii) Example of crystal with perfect covalent bonding is

a) Diamond b) methane c) NaCl d) sugar

(iv) The number of symmetry elements to a cubic crystal is

a) 32 b)7 c)23 d)232

(v) In electromagnetic spectrum, compared to visible light, the x-rays have _____ .

a) The wavelength is smaller and the energy is higher.

b) The wavelength is larger and the energy is larger.

c) The wavelength is smaller and the frequency is lower.

d) The energy and frequency both are lower.

(vi) Liquid crystal display is actually a combination of two states of matter

a) Solid-solid b) solid-liquid c) liquid-liquid d) none of these

Q.1. (B) Answer in one statement: (03)

(i) What is metastable state?
(ii) Define primitive cell.
(iii) Define resistivity.

Q.1. (C) Fill in the blanks: (05)

(i) Through holography we can produce _____ dimensional images of objects.

(ii) The refractive index of core of an optical fiber is_____ than cladding material.

(iii) The SI unit of conductivity is _____ .

(iv) Above Curie temperature, ferromagnetic substance converts into_____ .

(v) The number of atoms per unit cell in FCC structure is _____ .

Q.2. (A) Attempt any one: **(08)**

(i) What is meant by reverberation and reverberation time? Explain the causes to form reverberation in a hall. How it can be minimized?

(ii) With the help of a neat labeled diagram of optical resonator explain the basic principle of laser. Also explain the process of amplification.

Q.2. (B) Attempt any one: **(08)**

(i) Describe the structure of a step-index optical fiber. Explain the propagation of light through it.

(ii) Define absorption coefficient of a material and hence determine the relation between reverberation time of a hall and absorption coefficient.

Q.2. (C) Attempt any one: **(04)**

(i) The room has wall area 200 m^2, the floor area is 180 m^2 and the ceiling area is 180 m^2. The volume of the auditorium is 845 m^3. The average sound absorption coefficient for the walls is 0.028, for ceiling is 0.65 and for the floor is 0.06. Calculate the average sound absorption coefficient and the reverberation time.

(ii) The core and the cladding of an optical fibre have refractive indices 1.432 and 1.413 respectively. Find the acceptance angle in air; and the critical angle for core/cladding interface.

Q.3. (A) Attempt any one: **(08)**

(i) Show that in cubic crystal the distance between adjacent planes with miller indices (hkl) is given by, $d_{hkl} = a/(h^2+k^2+l^2)^{1/2}$, where a is the lattice constant.

(ii) Discuss the crystal structures of diamond, cesium chloride, sodium chloride and zinc sulphide.

Q.3. (B) Attempt any one: **(08)**

(i) Obtain distribution of atoms in the atomic planes of simple cubic crystal for (010),(110) and(111) planes.

(ii) What is a close-packed structure? Explain with suitable diagram the HCP and FCC close-packed structures.

Q.3. (C) Attempt any one: **(04)**

(i) Copper has FCC structure and its atomic radius is 1.278A^0.calculate the interplanar spacing for the (111) and (321) planes.

(ii) The lattice constant of the unit cell of a bcc structure is 0.287 nm. Find the number of atoms/mm^2 of the planes (100), (110) and (111).

Q.4. (A) Attempt any one: **(08)**

(i) Mention any four important characteristics of semiconducting materials and any two applications.

(ii) Explain hysteresis curve of ferromagnetic materials on the basis of domain theory.

Q.4. (B) Attempt any one: **(08)**

(i) How the materials are classified according to their magnetic properties? Explain.

(ii) Mention any four important characteristics of insulating materials and any two applications.

Q.4. (C) Attempt any one: **(04)**

(i) What is the difference between intrinsic and extrinsic semiconductors?

(ii) Differentiate between soft and hard magnetic materials.

Q.5. Attempt any four: **(20)**

(i) State the factors affecting the acoustics of building.
(ii) Explain the applications of fibre optics.
(iii) Explain crystal lattice and miller indices.
(iv) What is a bravis or space lattice? How is it related to crystal structure?
(v) Write a note on dielectric materials.
(vi)Compare paramagnetic and ferromagnetic materials.

-X-X-X- Best of Luck –X-X-X-