

First / Second Semester B.E. Degree Examination, June / July 08
Engineering Physics

Time: 3 hrs.

Max. Marks:100

Note : Answer any FIVE full questions.

1.
 - a. From the inferences drawn from the photoelectric effect explain how the de-Broglie's hypothesis was visualized. (05 Marks)
 - b. Explain DG experiment and bring out how the result of the experiment is consistent with de-Broglie hypothesis. (10 Marks)
 - c. Assuming that the radius of a nucleus of the order of 10^{-14} m calculate the energy associated with a free particle of mass 9.1×10^{-31} kg within this nucleus. Comment on the result obtained. (05 Marks)
2.
 - a. What is normalization of a wave function and give its significance. Obtain an expression for the energy of a particle inside a potential well of infinite height and calculate the gap between the ground state and the first two excited states. (10 Marks)
 - b. Explain the formation of cooper pairs and discuss their importance also discuss how BCS theory explains isotopic effect. (06 Marks)
 - c. Write a brief note on high temperature superconductors. (04 Marks)
3.
 - a. What are dielectric materials? Explain the dependence of polarizability and dielectric loss on frequency. (09 Marks)
 - b. Explain the importance of ferrites over ferromagnets. Discuss the properties of soft and hard magnets. (08 Marks)
 - c. What is the polarization production produced in sodium chloride by an electric field of 500 V/m if it has relative permittivity of 6. (03 Marks)
4.
 - a. Discuss quantum free electron theory. (05 Marks)
 - b. Obtain an expression for density of states in a metal from the quantum of free electron theory. (10 Marks)
 - c. Show that sum of the probability of occupancy ΔE below the Fermi level and probability of occupancy ΔE above the Fermi level is one. (05 Marks)
5.
 - a. Explain the concept of stimulated emission and population inversion as applied to laser. Give the construction and working of Ruby laser. (09 Marks)
 - b. A Helium-Neon laser is emitting laser beam with an average power of 4.5 mW. Find the number of photons emitted per second by the laser. The wavelength of the emitted radiation is 6328 \AA . (06 Marks)
 - c. Write a note on holography. (05 Marks)
6.
 - a. Explain the working principle of optical fiber and hence establish the condition for the propagation of light through optical fibers. (06 Marks)
 - b. Explain the factors which effect and lead to the attenuation of signal through optical fibers. (06 Marks)
 - c. Derive Bragg's law. Explain the emission of continuous X-ray spectrum and show that λ_{\min} depends only on the applied potential. (08 Marks)
7.
 - a. What are Miller indices? Derive an expression for the interplanar spacing in terms of Miller indices. (08 Marks)
 - b. A monochromatic X-ray beam of wavelength 0.7 \AA undergoes first order Bragg reflection from the plane [302] of a cubic crystal at a glancing angle of 35° . Calculate the lattice constant. (06 Marks)
 - c. Sketch the following planes in a cubic crystal:
 i) (213) ii) (110) iii) (TTO). (06 Marks)
8.
 - a. What are composite materials? Give the classification of composite materials. (08 Marks)
 - b. Explain the density of states for various quantum structures. (06 Marks)
 - c. Write a note on MEMS. (06 Marks)