CBCS SCHEME

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15PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2024
Engineering Physics

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***

2. ***Physical Constants: Velocity of light,*** $C = 3 \times 10^8$ ***m/S,***
Plank's constant $h = 6.625 = 10^{-34}$ ***JS;***
Mass of electron $m_e = 9.11 \times 10^{-31}$ ***kg,***
Boltzmann constant $K = 1.38 = 10^{-23}$ ***J/K,***
Avagadro number, $N_A = 6.02 \times 10^{26}$ ***/Kmole,***
Charge of electron $e = 1.6 \times 10^{-19}$ ***C.***

Module-1

1 a. Explain briefly the Planck's radiation law and reduce it to Wien's law and Rayleigh-Jeans law. **(06 Marks)**

b. Using time – independent Schrodinger's wave equation for a particle in one dimensional potential well of infinite height, obtain an expression for normalization of wave function. **(06 Marks)**

c. An electron is bound in one dimensional well of width 0.5A° but of infinite height. Find the energy value in eV for the ground state and first two excited state. **(04 Marks)**

OR

2 a. What is Phase velocity and group velocity? Obtain the relation between phase velocity and group velocity. **(06 Marks)**

b. What is Wave function 'Ψ'? Give its properties and physical significance. **(06 Marks)**

c. Calculate the de - Broglie wavelength associated with an electron whose kinetic energy is 150 eV. **(04 Marks)**

Module-2

3 a. What are the assumptions of classical free electron theory? Define :
i) Mean free path ii) Drift velocity. **(06 Marks)**

b. What is Fermi factor? Discuss the dependence of Fermi factor on temperature and effect on occupancy of energy levels. **(06 Marks)**

c. Calculate the Fermi temperature (T_F) and Fermi Velocity (V_F) in case of copper metal with Fermi energy 6.8eV. **(04 Marks)**

OR

4 a. Explain the merits of Quantum free electron theory. **(06 Marks)**

b. Describe the types of superconductors. **(05 Marks)**

c. What is superconductivity? Explain the working of Maglev vehicles. **(05 Marks)**

Module-3

5 a. Explain the construction and working of CO_2 laser with the help of energy level diagram. **(08 Marks)**

b. Obtain an expression for Numerical aperture in an optical fibre. **(04 Marks)**

c. The angle of acceptance of an optical fibre is 38° when kept in air. Find the angle of acceptance when it is in a medium of Refractive index 1.33. **(04 Marks)**

OR

6 a. Derive an expression for energy density of radiation in terms Einstein's A and B coefficients. **(06 Marks)**

b. Explain three types of optical fibers with a neat diagram. **(06 Marks)**

c. Find the ratio of population of two energy levels of the wavelength of light emitted at 340K is 6340A°. **(04 Marks)**

Module-4

7 a. Define Miller Indices and obtain expression for inter-planar spacing in terms of Miller Indices in cubic structure. **(06 Marks)**

b. What is polymorphism and Allotropy? Show that Atomic packing factor in SCC is 0.52 and in fcc is 0.74. **(06 Marks)**

c. Draw the following crystal planes (132), (001), (101) and (OTO). **(04 Marks)**

OR

8 a. Define atomic packing factor and co-ordination number Determine the co-ordination number in BCC structure. **(04Marks)**

b. Discuss briefly the seven crystal systems. Draw crystal structures for cubic system. **(08 Marks)**

c. A monochromatic beam of electrons with Kinetic energy 235.2eV undergoes first order Bragg reflection in a crystal at a glancing angle of 9°12′35″. Calculate the interplanar spacing. **(04Marks)**

Module-5

9 a. What is Mach number? Explain experimental method of finding Mach number of a shock wave by Reddy Shock tube. **(06 Marks)**

b. Describe arc discharge method of obtaining carbon nano tubes with the help of a diagram. **(06 Marks)**

c. Distinguish between acoustic, ultrasonic, subsonic and supersonic waves. **(04 Marks)**

OR

10 a. Discuss the basis of laws of conservation of energy, mass and momentum. **(07 Marks)**

b. Discuss the structure and properties of carbon nano tubes. **(05 Marks)**

c. Explain Sol-gel method of preparing nanomaterials. **(04 Marks)**

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