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15PHY12/22

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Physics

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer FIVE full questions, choosing one full question from each module.
2. Physical Constants : Velocity of light, c = 3 x 10 ^{8} ms^{-1},
Planck's constant, h = 6.625 x 10 $^{-34}$ J.S,
Mass of electron, m $_{e}$ = 9.1 x 10^{-31} kg,
Avogadro number, NA = 6.02 x 10^{26}/Kmol,
Boltzmann constant, k =1.38 x 10 $^{-23}$ J/K,
Charge of an electron, e = 1.602 x 10 $^{-19}$ C

Module-1

1 a. State Planck's radiation law. Show how Planck's law could be reduced to Wien's law and Rayleigh-Jeans law. **(07 Marks)**

b. State Heisenberg's uncertainty principle and show that electron does not exist inside the nucleus by this principle. **(05 Marks)**

c. Find deBroglie wavelength of a particle of mass 0.58 MeVA^{2} Thas a kinetic energy 90 eV, where c is velocity of light. **(04 Marks)**

OR

2 a. Using Schrodinger's time independent wave equation obtain eigen values and eigen function for a particle in a one dimensional potential well of infinite height. **(07 Marks)**

b. Define phase velocity and group velocity. Show that group velocity is equal to particle velocity. **(05 Marks)**

c. The inherent uncertainty in the measurement of time spent by Iridium - 191 nuclei in the excited state is found to be 1.4 x 10 $^{1^{\circ}}$ s. Estimate the uncertainty that results in its energy in eV in the excited state. **(04 Marks)**

Module-2

3 a. Explain Meissner effect. Write any three differences between Type-I and Type-II superconductors. **(07 Marks)**

b. Explain the failure of classical electron theory. **(05 Marks)**

c. For intrinsic Gallium Arsenide, the electric conductivity at room temperature is 10^{-6} ohm' m'. The electron and hole mobilities are respectively 0.85 m ^{2}/V.S and 0.04 m^{2}/V.S. Calculate the intrinsic carrier concentration at room temperature. **(04 Marks)**

OR

4 a. State law of mass action. Obtain an expression for electrical conductivity of semiconductors. **(07 Marks)**

b. Explain the BCS theory of super conductivity. **(05 Marks)**

c. Calculate the probability of finding an electron at an energy level 0.02 eV above Fermi level at 200 K. **(04 Marks)**

Module-3

5 a. Describe construction and working of carbon dioxide laser with suitable diagrams. **(07 Marks)**
b. Obtain an expression for the numerical aperture of an optical fiber. **(05 Marks)**
c. Find the ratio of population of two energy levels in a medium at thermal equilibrium, if the wavelength of light emitted at 291 K is 6928 A . **(04 Marks)**

OR

6 a. Describe the recording and reconstruction process in holography with the help of suitable diagrams. **(07 Marks)**
b. Discuss point to point optical fiber communication system. **(05 Marks)**
c. Calculate the numerical aperture and angle of acceptance for an optical fiber having refractive indices 1.563 and 1.498 for core and cladding respectively. **(04 Marks)**

Module-4

7 a. Describe briefly the seven crystal systems. **(07 Marks)**
b. Describe with a neat diagram the crystal structure of diamond. **(05 Marks)**
c. Draw the crystal planes (102) (111) (011) and (002) in a cubic crystal. **(04 Marks)**

OR

8 a. Define atomic packing factor. Calculate the atomic packing factor for sc, bcc and fcc structures. **(07 Marks)**
b. Describe the construction and working of a Bragg's x-ray spectrometer. **(05 Marks)**
c. An x-ray beam of wavelength 0.7 A undergoes first order Bragg's reflection from the plane (302) of a cubic crystal at glancing angle 35°, calculate the lattice constant. **(04 Marks)**

Module-5

9 a. Explain Ball Milling method of synthesis of nano materials. **(06 Marks)**
b. Describe hand operated Reddy shock tube with diagram. **(05 Marks)**
c. Define shock waves. Mention its applications. **(05 Marks)**

OR

10 a. Explain the working of SEM with the help of a neat diagram. **(07 Marks)**
b. Mention Rankine-Hugonit shock equations and expand the terms. **(05 Marks)**
c. Write any four applications of carbon nano tubes. **(04 Marks)**