Model Question Paper (CBCS) with effect from 2015-16

USN | | | | | | | | | | |

15PHY12/22

First/Second Semester B.E. Degree(CBCS)Examination

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 = $3x10^8$m/s, Planck's constant, h = $6.625x10^{-34}$ JS; Mass of electron m= $9.1x10^{-31}$kg; Boltzmann constant, k = $1.38x10^{-23}$ J/K; Avagadro number, N_A = $6.02X10^{26}$/K mole

Module-1

1 a. State Planck's law of black body radiation. Show that Planck's law reduces to Wien's law and Rayleigh Jeans law at lower and higher wavelength limits respectively. **(07 Marks)**

b. Based on Heisenberg's uncertainty principle, show that electrons cannot exist within the nucleus. **(05 Marks)**

c. Calculate the de Broglie wavelength of an electron moving with a K.E. of 50 Kev. **(04 Marks)**

OR

2 a. What is phase velocity and group velocity? Show that group velocity is equal to particle velocity. **(05 Marks)**

b. Obtain the solution of Schrodinger's time independent wave equation for a particle in a one dimensional potential box of infinite height. **(07 Marks)**

c. X-rays of wavelength 0.75 Å are scattered from a target at an angle of 45^o. Calculate the wavelength of scattered X-rays. **(04 Marks)**

Module-2

3 a. What is Fermi level? Describe the variation of Fermi factor with temperature. **(05 Marks)**

b. What is Meissner effect? Write a note on Type – I and Type – II super conductors. **(07 Marks)**

c. For intrinsic gallium arsenide, the room temperature electrical conductivity is 10^{-6} $ohm^{-1}m^{-1}$. The electron and hole mobilities are respectively 0.85 m^2/Vs and 0.04 m^2/Vs. Calculate the intrinsic carrier concentration at room Temperature. **(04 Marks)**

OR

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

b. State law of mass action. Obtain an expression for the intrinsic carrier density. **(07 Marks)**

c. Calculate the probability of finding an electron at an energy level 0.02 eV above Fermi level at 300K. **(04 Marks)**

Module-3

5 a. Explain the construction and working of carbon dioxide Laser. **(08 Marks)**

b. Obtain an expression for the numerical aperture of an optical fiber. **(04 Marks)**

c. The average power output of a laser beam of wavelength 6500 Å is 10 mw. Find the number of photons emitted per second by the laser source. **(04 Marks)**

OR

6 a. What is holography? Explain the principle and method of recording an image on a hologram. **(06 Marks)**

b. Explain the different types of optical fibers. **(06 Marks)**

c. An Optical signal propagating in a fiber retains 85% of input power after travelling a distance of 500 m in the fiber. Calculate the attenuation coefficient. **(04 Marks)**

Module-4

7 a. Obtain an expression for the inter planar distance in a cubic crystal in terms of Miller indices. **(05 Marks)**

b. What is atomic packing factor? Calculate the atomic packing factor for SC, FCC and BCC structures. **(07 Marks)**

c. First order spectrum is formed when X - rays of wavelength 1.5 Å is incident on a crystal at a glancing angle 0f 12^0. Calculate the inter planar distance. If the Miller indices of the plane is (1 0 1) , then find the lattice constant. **(04 Marks)**

OR

8 a. With the help of a neat diagram explain the crystal structure of diamond and calculate its atomic packing factor. **(06 Marks)**

b. Explain allotropy and polymorphism. **(06 Marks)**

c. Draw the crystal planes (1 2 0) and (1 0 1) in a cubic crystal. **(04 Marks)**

Module-5

9 a. What is Mach number? Explain the difference between ultra sonic and acoustic Waves? **(04 Marks)**

b. What is a carbon nano tube? Explain how it is synthesized using pyrolysis method. **(06 Marks)**

c. Explain the working of SEM with the help of a neat diagram. **(06 Marks)**

OR

10 a. Briefly explain the Rankine – Hugonit shock equations. **(05 Marks)**

b. Explain the Sol - Gel method of synthesis of nano materials. **(07 Marks)**

c. Write a note on applications of carbon nano tubes. **(04 Marks)**

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