CBCS Scheme

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

15PHY12/22

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
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: $h = 6.625\times 10^{-34}$JS, $M_e = 9.1\times10^{-31}$ kg, $K = 1.38 \times 10^{-23}$ J/K, $C = 3\times 10^{8}$ m/s, $e = 1.602 \times 10^{-19}$ C, $N_A = 6.025 \times 10^{+26}$/k mol.

Module-1

1 a. Explain the energy distribution in the spectrum of a blackbody. **(05 Marks)**

b. Set up time independent Schrödinger wave equation in one dimension. **(07 Marks)**

c. A particle of mass 0.5 Me V/c^2 has kinetic energy 100eV. Find its de-Broglie wavelength. **(04 Marks)**

OR

2 a. Define phase velocity and Group velocity. Show that group velocity is equal to particle velocity. **(06 Marks)**

b. State and explain Heisenberg's uncertainty principle. **(06 Marks)**

c. An electron is bound in one dimensional potential well of width 0.18nm. Find the energy value in eV of the second excited state. **(04 Marks)**

Module-2

3 a. What is superconductivity? Explain superconductivity on the basis of BCS theory. **(06 Marks)**

b. Explain the failures of classical free electron theory. **(06 Marks)**

c. Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level at 400K in a material. **(04 Marks)**

OR

4 a. What is Fermi factor? Discuss the probability of occupation of various energy states by electrons at T = 0°K and T > 0°K on the basis of Fermi factor. **(06 Marks)**

b. What is Meissner effect? Explain the working of maglev. **(06 Marks)**

c. The electron mobility and hole mobility of silicon are $0.17 m^2$/volt-sec and $0.035\ m^2$/volt-sec respectively at room temperature. If the carrier density is known to be $1.1\times10^{16}/m^3$, calculate the resistivity of silicon semiconductor material. **(04 Marks)**

Module-3

5 a. Derive the expression for energy density of radiation in terms of Einstein's coefficients. **(06 Marks)**

b. With neat diagrams explain the different types of optical fibers. **(06 Marks)**

c. A medium in thermal equilibrium at temperature 300K has two energy levels with a wavelength separation of 1μm. Find the ratio of population densities of the upper and lower levels. **(04 Marks)**

OR

6 a. What is Holography? With a neat diagram, explain the construction, reconstruction of Hologram. **(06 Marks)**

b. What is numerical aperture? Obtain an expression for numerical aperture in terms of refractive indices of core and cladding. **(06 Marks)**

c. The attenuation of light in an optical fiber is 3.6dB/km, what fraction of its initial intensity remains after i) 1km ii) 3km ? **(04 Marks)**

Module-4

7 a. What are Miller indices? Derive the expression for the interplanor spacing in terms of Miller indices. **(06 Marks)**

b. Describe the construction and working of Bragg's X-ray spectrometer. **(06 Marks)**

c. First order Bragg reflection occurs when a monochromatic beam of X-rays of wavelength 0.675A° is incident on a crystal at a glancing angle of 4°51′. What is the glancing angle for third order Bragg reflection to occur? **(04 Marks)**

OR

8 a. Define coordination number and atomic packing factor. Calculate the coordination number for sc, bcc and fcc structures. **(07 Marks)**

b. Derive Bragg's law. **(05 Marks)**

c. Draw the crystal planes (100) (200) (001) and (011) in a cubic unit cell. **(04 Marks)**

Module-5

9 a. What is Mach number? Distinguish between acoustic, ultrasonic, subsonic and supersonic waves. **(05 Marks)**

b. What are nanomaterials? Explain the Sol – Gel method of synthesis of nano-materials. **(07 Marks)**

c. In a scanning electron microscope, electrons are accelerated by an anode potential difference of 60kV. Estimate the wavelength of the electron in the scanning beam. **(04 Marks)**

OR

10 a. What is a shock wave? Describe the construction and working of Reddy's shock tube. **(07 Marks)**

b. What is a carbon nano tube? Explain how it is synthesized using pyrolysis method. **(05 Marks)**

c. Mention the principle and three applications of SEM. **(04 Marks)**

* * * * *