CBCS Scheme

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

17PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2018
Engineering Physics

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing one full question from each module.***
2. ***Physical constants : $C = 3 \times 10^8$ m/s , $h = 6.63 \times 10^{-34}$ JS , $K = 1.38 \times 10^{-23}$ J/K , $m = 9.11 \times 10^{-31}$ kg , $e = 1.6 \times 10^{-19}$ C , $NA = 6.02 \times 10^{26}$ kmol.***

Module-1

1 a. Define a black body. Deduce Wien's law and Rayleigh Jeans law from Planks law of Radiation. **(07 Marks)**

b. Set – up One dimensional time independent Schrodinger wave equation. **(06 Marks)**

c. Explain the energy distribution in the spectrum of Black body. **(03 Marks)**

d. An electron is bound in one dimensional potential well of width 0.12nm. Find the energy values in the ground state and also in first two excited states. **(04 Marks)**

OR

2 a. State Heisenberg's Uncertainty Principle. Show that free electrons cannot exist inside the nucleus. **(07 Marks)**

b. Define Phase Velocity and Group Velocity. Derive the relation between them. **(06 Marks)**

c. Write a note on Compton effect. **(03 Marks)**

d. A particle of mass 0.65MeV/C^2 has free energy 120MeV. Find its deBroglie wavelength. [Where 'C' is speed of light]. **(04 Marks)**

Module-2

3 a. What is Fermi Factor? Discuss the variation of Fermi factor with temperature. **(07 Marks)**

b. What is Superconductivity? Explain Type – I and Type – II superconductors. **(06 Marks)**

c. Define : i) Mean collision time ii) Relaxation time iii) Drift velocity. **(03 Marks)**

d. Find the probability that an energy level at 0.2eV below fermi level being occupied at temperatures 300K and 1000K. **(04 Marks)**

OR

4 a. Derive the expression for electrical conductivity by using Quantum free electron theory in case of metals. **(07 Marks)**

b. Explain the failures of CFET. (Classical Free Electron Theory). **(06 Marks)**

c. Write a note on High temperature superconductors. **(03 Marks)**

d. The electron and hole mobilities of silicon are 0.14 $m^2V^{-1}S^{-1}$ and 0.05 $m^2V^{-1}S^{-1}$ respectively at a certain temperature. If the electron density is 1.5×10^{16} electrons/m^3 then calculate the resistivity of silicon. **(04 Marks)**

Module-3

5 a. Obtain an expression for energy density of radiation in terms of Einsteins co-efficient. **(07 Marks)**

b. Write a note on different types of optical fibers. **(06 Marks)**

c. Mention any three applications of LASERS. **(03 Marks)**

d. Calculate the Numerical aperture, V – number and and number of modes in an optical fibre of core diameter 50μm. Refractive indices are 1.41 and 1.40 respectively at wavelength of 820nm. **(04 Marks)**

OR

6 a. Explain the construction and working of CO_2 Laser with the help of energy level diagram. **(07 Marks)**

b. What is Holography? With a neat diagram, explain the recording and reconstruction process of a Hologram. **(06 Marks)**

c. Define : i) Numerical Aperture ii) Angle of Acceptance iii) Attenuation. **(03 Marks)**

d. Find the ratio of the populations of the two states in a material that produces light of wavelength 6328 $\overset{0}{A}$ at 27^0C. **(04 Marks)**

Module-4

7 a. What are Miller Indices? Derive an expression for Interplanar distances in terms of Miller Indices. **(07 Marks)**

b. Explain Bragg's X – ray Spectrometer. **(06 Marks)**

c. Define : i) Unit cell ii) Bravaice Lattice iii) Primitive cell. **(03 Marks)**

d. Draw the following planes in a cubic unit cell :
i) (1 1 1) ii) (0 2 0) iii) (1 $\bar{1}$ 2) iv) (3 0 1). **(04 Marks)**

OR

8 a. Explain in brief the Seven Crystal systems, with neat diagrams. **(07 Marks)**

b. Explain the crystal structure of diamond. **(05 Marks)**

c. Calculate APF for BCC and FCC structures. **(04 Marks)**

d. X – rays are diffracted in the first order from (110) plane of cubic crystal with lattice constant 3.036 $\overset{0}{A}$ at a glancing angle 9.6^0. Calculate the wavelength of X – rays. **(04 Marks)**

Module-5

9 a. What are Shock waves? Explain the construction and working of Reddy Shock tube. **(07 Marks)**

b. What are Nano materials? Explain the Sol – gel method of synthesis of nano materials. **(06 Marks)**

c. Mention four applications of shock waves. **(04 Marks)**

d. Calculate the wavelength of an electron accelerated under a potential difference of 100V in SEM. **(03 Marks)**

OR

10 a. Explain the principle, construction and working of Scanning Electron Microscope. **(07 Marks)**

b. Define Carbon Nanotubes (CNTs). Discuss pyrolysis method of obtaining CNTs. **(06 Marks)**

c. Mention three applications of CNTs. **(03 Marks)**

d. Distinguish between Acoustic, Ultrasonic , Subsonic and Supersonic waves. **(04 Marks)**

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