Model Question Paper with effect from 2017-18
CBCS Scheme

First/Second Semester B.E. Degree Examination
Engineering Physics

Time : 3 hrs   Max. Marks: 100

Note: 1. Answer FIVE full questions, choosing one full question from each module.
2. Physical constants: Velocity of light $c = 3 \times 10^8 m/s$; $h = 6.625 \times 10^{-34} JS$; $k = 1.38 \times 10^{-23} J/K$;
$N_A = 6.02 \times 10^{23}/Kmole$; $m_e = 9.1 \times 10^{-31} kg$; $e = 1.6 \times 10^{-19}C$.

Module – 1

1 a. What is a black body? Discuss in brief Wien's law and Rayleigh – jean's law to explain black body spectrum. Describe ultraviolet catastrophe. **(8 marks)**

b. State and explain Heisenberg uncertainty principle. Discuss the significance of the principle. Prove that, using uncertainty principle, the electron emitted during β-decay is not the preexisted electron in nucleus. **(8 marks)**

c. An electron is confined to a potential well of infinite height and width $5A^0$. Calculate the de Broglie wavelength when the electron is (i) in ground state and (ii) 3rd excited state **(4 marks)**

OR

2 a. What are matter waves? Discuss their characteristics **(5 marks)**

b. Define Phase velocity and Group velocity. Obtain the relation between them and hence show that in a non-dispersion medium the group and phase velocities are same. **(8 marks)**

c. Write a short note on properties of wave function. **(3 marks)**

d. Find the kinetic energy of an electron whose de Broglie wavelength is the same as that of a 100keV x-ray. **(4 marks)**

Module-2

3 a. Define the terms drift velocity, thermal velocity, mean free path and relaxation time. Explain why thermal velocity is not responsible for electric current in a conductor. **(5 marks)**

b. Explain briefly the formation of cooper pairs and hence BCS theory **(5 marks)**

c. Discuss any three major failures of classical free electron theory. **(6 marks)**

d. For a metal having 6.5×10^{28} free electrons per unit volume the relaxation time at room temperature 300K is 3.82×10^{-14} second. Calculate its electrical resistivity using classical free electron theory **(4 marks)**

OR

4 a. What is a super conductor? Explain Meissner effect **(4 marks)**

b. Give the expressions for concentration of electrons and holes in an intrinsic semi-conductor. Obtain the expression for electrical conductivity of intrinsic semiconductor. **(8 marks)**

c. What is Fermi-Dirac statistics? Explain **(4 marks)**

d. A superconducting tin has a critical temperature at 3.7K in zero magnetic fields and a critical field of 0.0306 T at 0K. Find the critical field at T_C. **(4 marks)**

Module-3

5 a. State and explain the necessary conditions for laser **(5 marks)**
b. With a neat diagram explain the construction and working of semiconductor laser **(7 marks)**
c. Describe briefly the application of laser in welding and cutting **(4marks)**
d. The angle of acceptance of an optical fiber is 30^0 when kept in air. Find the angle of acceptance when it is in a medium of RI 1.33 **(4 marks)**

OR

6 a. What is attenuation in optical fiber? Discuss the various loss factors in optical fiber communication **(7 marks)**
b. Discuss the any three advantages and disadvantages of optical fiber communication system over conventional communication system **(6 marks)**
c. Mention the applications of holography **(3 marks)**
d. Calculate on the basis of Einstein's theory, the number of photons emitted per second by laser source emitting light of wavelength $6328A^0$ with an optical power output 10mW. **(4 marks)**

Module – 4

7 a. Define lattice points, unit cell, Bravais lattice and primitive cell **(4 marks)**
b. Describe briefly the seven crystal systems **(7 marks)**
c. Obtain an expression for the inter planar distance in a cubic crystal in terms of Miller indices **(6 marks)**
d. The grating space of calcite is $3.036A^0$ and for the first order Bragg reflection the glancing angle is 12^0. Find the path difference between the rays **(3 marks)**

OR

8 a. Discuss the allotropy of carbon with reference to diamond and graphite **(4 marks)**
b. Give a qualitative explanation of perovskite crystal structure **(6 marks)**
c. Define coordination number and packing factor. Calculate the packing factor for BCC structure **(6 marks)**
d. Draw the crystal planes (120), (1110, (101) and ($\bar{1}$00) in a cubic crystal. **(4 marks)**

Module – 5

9 a. Define Mach number and hence distinguish between subsonic and supersonic waves **(4 marks)**
b. List the properties of shock waves. Give an example for weak and strong shock waves **(6 marks)**
c. With a neat diagram explain the construction and working of Reddy shock tube **(7 marks)**
d. Discuss the advantages of Sol-Gel method **(3 marks)**

OR

10 a. With a neat diagram explain how the carbon nano tubes are synthesized using arc discharge method. **(8 marks)**
b. Describe density of states for various quantum structures **(6 marks)**
c. Discuss the basics of conservation of mass, momentum and energy **(6 marks)**