CBCS SCHEME

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First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 : Plank's constant, $h = 6.63 \times 10^{-34} JS$; Mass of electron,
$m = 9.11 \times 10^{-31} kg$; Boltzmann constant, $k = 1.38 \times 10^{-23} J/k$;
Avogadro number, $N_A = 6.02 \times 10^{26}/Kmole$; Velocity of
light, $c = 3 \times 10^8 m/s$; Charge of electron, $e = 1.602 \times 10^{-19} C$.

Module-1

1 a. What are postulates of Plank's quantum theory of black body radiations? Deduce Rayleigh and Jean's law from Planks's law. **(06 Marks)**

   b. Define phase velocity and group velocity. Obtain the relation between group velocity and phase velocity. **(06 Marks)**

   c. An electron has a speed of 800 m/s with an accuracy of 0.004%. Calculate the certainty with which one can locate the position of the electron. **(04 Marks)**

OR

2 a. State Heisenberg's uncertainty principle and express three forms of uncertainty relations. **(04 Marks)**

   b. Explain probability density. Set up one dimensional time independent Schrodinger wave equation. **(08 Marks)**

   c. An electron is confined to move between two rigid walls separated by 1 nm. Find the de-Broglie wavelength of the electron corresponding to first excited energy state. **(04 Marks)**

Module-2

3 a. Define Fermi-Dirac distribution function and explain the effect of temperature and energy on Fermi factor. **(06 Marks)**

   b. Discuss the merits of quantum free electron theory. **(06 Marks)**

   c. A metallic wire has a resistivity of 1.42×10^{-8} Ωm for an electric field of 0.14 Vm^{-1}. Find:
   i) Mean collision time   ii) Average draft velocity, assuming that there are 6×10^{28} electrons/m^3. **(04 Marks)**

OR

4 a. Explain in brief expressions for electron and hole concentrations in conduction band and valence band of intrinsic semi conductor. **(06 Marks)**

   b. What is Meissner effect? Explain two types of super conductors. **(06 Marks)**

   c. Calculate the Fermi energy of sodium at 0 K assuming that it has one free electron per atom and a density of sodium is 970 kg/m^3 and atomic weight 23. **(04 Marks)**

Module-3

5 a. Explain the welding mechanism and measurements of atmospheric pollutants using laser. **(05 Marks)**

   b. Describe the construction and working of carbon dioxide laser with energy level diagram. **(08 Marks)**

   c. Optical power of 1 mw is launched into an optical fibre of length 100 m. If the power emerging from the other end is 0.3 mw. Calculate the fibre attenuation. **(03 Marks)**

OR

6 a. Discuss the different types of optical fibres with sketches. (06 Marks)
   b. What is holography? Explain the recording and reconstruction processes in holography with neat diagram. (06 Marks)
   c. The output wavelength of CO_2 laser is 10.6 μm. If it produces an output of 1 kw, how many photons are emitted in one minute? (04 Marks)

Module-4

7 a. Define atomic packing factor. Explain seven crystal systems. (08 Marks)
   b. What are Miller Indices? Explain the procedure to find Miller Indices with example. (04 Marks)
   c. Calculate the wavelength of monochromatic beam of x-ray is incident on the plane (121) of $NaCl$, with a glancing angle 23.8°, results in second order diffraction maxima with a lattice constant 3.21 Å. (04 Marks)

OR

8 a. Define the terms:
      i)   Unit cell
      ii) Space lattice
      iii) Co-ordination number
      iv) Basis
      v)   Crystal structure (05 Marks)
   b. Define polymorphism and allotropy. Describe Bragg's spectrometer. Explain the determination of crystal structure. (08 Marks)
   c. Molybdenum has a BCC structure. Its Lattice parameter is 3.15 Å. Determine the radius of molybdenum atom. (03 Marks)

Module-5

9 a. Explain the construction and working of scanning electron microscope with neat diagram. (06 Marks)
   b. Define Mach number. Explain the distinction between subsonic and supersonic waves with suitable example. (05 Marks)
   c. Describe construction and working of Reddy's shock tube. (05 Marks)

OR

10 a. Explain density of states for any three quantum structures with graphical representation. (06 Marks)
   b. Describe sol-gel method for producing nano materials. (05 Marks)
   c. Explain the synthesis of carbon nanotubes using arc-discharge method. (05 Marks)

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