CBCS SCHEME

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15PHY12/22

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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