CBCS SCHEME

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

15PHY12/22

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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:*** ***Velocity of light,*** $C = 3\times10^{8}$ ***m/S,***
Plank's constant $h = 6.625\times10^{-34}$ ***JS;***
Mass of electron $m_e = 9.11\times10^{-31}$ ***kg,***
Boltzmann constant $K = 1.38\times10^{-23}$ ***J/K,***
Avagadro number, $N_A = 6.02\times10^{26}$ ***/Kmole,***
Charge of electron $e = 1.6\times10^{-19}$ C

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain briefly the Planck's radiation law and reduce it to Wien's law and Rayleigh-Jeans law. **(06 Marks)**

b. Using time – independent Schrodinger's wave equation for a particle in one dimensional potential well of infinite height, obtain an expression for normalization of wave function. **(06 Marks)**

c. An electron is bound in one dimensional well of width $0.5A^0$ but of infinite height. Find the energy value in eV for the ground state and first two excited state. **(04 Marks)**

OR

2 a. What is Phase velocity and group velocity? Obtain the relation between phase velocity and group velocity. **(06 Marks)**

b. What is Wave function 'Ψ'? Give its properties and physical significance. **(06 Marks)**

c. Calculate the de - Broglie wavelength associated with an electron whose kinetic energy is 150 eV. **(04 Marks)**

Module-2

3 a. Derive an expression for electrical conductivity based on quantum free electron theory. **(06 Marks)**

b. What is Meissner effect? Distinguish between type I and type II superconductor. **(06 Marks)**

c. Calculate the Fermi velocity and mean free path for the conduction electrons in silver , given that its Fermi energy is 5.5eV, and the relaxation time for electrons is 3.83×10^{-14}s. **(04 Marks)**

OR

4 a. What is Superconductivity? Explain BCS theory of super conductivity. **(06 Marks)**

b. Explain how quantum free electron theory succeeded in overcoming the drawbacks of classical free electron theory. **(06 Marks)**

c. Calculate the drift velocity of the electron in the presence of an applied elective field of strength 50V/m, whose mobility in a conductor is 5×10^{-3} m^2 V^{-1} S^{-1}. **(04 Marks)**

Module-3

5 a. Explain the construction and working of CO_2 laser with the help of energy level diagram. **(08 Marks)**

b. Obtain an expression for Numerical aperture in an optical fibre. **(04 Marks)**

c. The angle of acceptance of an optical fibre is 38^0 when kept in air. Find the angle of acceptance when it is in a medium of Refractive index 1.33. **(04 Marks)**

OR

6 a. Derive an expression for energy density of radiation in terms Einstein's A and B coefficients. **(06 Marks)**

b. Explain three types of optical fibres with a neat diagram. **(06 Marks)**

c. Find the ratio of population of two energy levels of the wavelength of light emitted at 340K is 6340 A^0. **(04 Marks)**

Module-4

7 a. Define Unit cell. Describe briefly the seven crystal systems with neat diagram. **(08 Marks)**

b. Derive Bragg's law for X – ray diffractions by crystals. **(04 Marks)**

c. Draw the following planes in a cubic unit cell :
(100) , (110) (112) and (121). **(04 Marks)**

OR

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

b. Describe the crystal structure of Diamond. **(05 Marks)**

c. The interplanar spacing in a crystal is $1A^0$ and the glancing angle is 30^0. Calculate the wavelength of the X – rays for first order Bragg reflection. **(04 Marks)**

Module-5

9 a. Define Mach Number. Distinguish between ultrasonics and supersonic waves. **(04 Marks)**

b. What is carbon nanotube. Write down any four properties and four applications of carbon nanotube. **(06 Marks)**

c. Explain the Sol – Gel and ball milling methods of synthesis of nano materials. **(06 Marks)**

OR

10 a. What is Shock wave? Write down the applications of shock wave. **(04 Marks)**

b. Describe the construction and working of Reddy's shock tube. **(06 Marks)**

c. Explain with principle , working of Scanning Electron microscope. **(06 Marks)**

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