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Question Paper Code: R1P03

B.E. / B.Tech. DEGREE EXAMINATION, NOV/DEC 2024

First Semester

Computer Science and Engineering

R21UPH103- PHYSICS FOR INFORMATION SCIENCE

(Common to All CSE Allied branches)

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. Calculate the interplanar distance for (321) plane in SC lattice with $a = 4.12 \times 10^{-10} \text{ m}$ CO1-U
(a) $2.20 \times 10^{-10} \text{ m}$ (b) $1.01 \times 10^{-10} \text{ m}$ (c) $2.30 \times 10^{-10} \text{ m}$ (d) $3.20 \times 10^{-10} \text{ m}$
2. A particular metal has a simple cubic unit cell. How many atoms of the metal are in each unit cell? CO1-U
a) 1 b) 4 c) 6 d) 2
3. Which nature of light is exposed by its diffraction and interference CO2-U
(a) Nature of light is electromagnetic (b) Wave nature of Light
(c) Quantum nature of light (d) Longitudinal nature of light
4. Which of the following is the unique property of laser CO2-U
(a) Monochromatic (b) directionality
(c) coherence (d) all of them
5. Matter waves are not... .. waves CO2-U
(a) electric (b) magnetic (c) electromagnetic (d) plane

6. A neutron of mass 1.675×10^{-27} kg is moving with the kinetic energy 10 KeV. Calculate the De-Broglie wavelength associated with it. CO4-App
 (a) 1.6×10^{-15} J (b) 1.6×10^{-13} J (c) 1.6×10^{-12} J (d) 1.6×10^{-10} J
7. The low resistive materials are also generally called as ----- materials CO1-U
 (a) Conducting (b) Non conducting (c) Semi conducting (d) Insulator
8. The copper wire of length 1 m and resistance 0.02 ohm carry a current of 10 A. Find the voltage drop across the two ends. CO3-App
 (a) 0.2 ohm (b) 0.02 ohm (c) 2 ohm (d) 20 ohm
9. ----- and silicon are two important elemental semiconductors. They are used in diodes and transistors CO1-U
 (a) Germanium (b) Aluminum (c) Copper (d) Dielectrics
10. The compound semiconductor have ----- and carrier mobility CO1-U
 (a) Low forbidden gap (b) Less forbidden gap
 (c) Large forbidden gap (d) None of these

PART – B (5 x 2= 10 Marks)

11. The lattice constant for a FCC structure is 4.938 \AA . Calculate the Interplanar spacing of (220) planes. CO3-App
12. What are the characteristics of laser? CO2-U
13. What is physical significance of wave function? CO1-U
14. Define mean free path. CO1-U
15. What are the differences between intrinsic & extrinsic semiconductor. CO2-U

PART – C (5 x 16= 80 Marks)

16. (a) (i) Obtain packing factors for SC, BCC and FCC lattices. CO3- App (12+4)
 (ii) The Interplanar distance of (110) planes in a BCC crystal is 2.03 \AA . What is the lattice parameter of the crystal?
- Or
- (b) (i) Show that the atomic packing factor of FCC and HCP are the same. CO3- App (12+4)
 (ii) If the d- spacing of (110) plane is 2 \AA for a cubic crystal, find out the atomic radius.

17. (a) Show that the fringe width between the successive bright and dark fringes using Young's double slit experiment is equal. CO2- U (16)
- Or
- (b) Discuss the different pumping mechanism involved in laser action. Explain briefly about the characteristics of laser. CO2- U (16)
18. (a) (i) Define Compton effect. CO4-App (2+14)
(ii) Derive an expression for the wavelength of scattered photon (Compton shift).
- Or
- (b) (i) Derive the Schrodinger's time independent wave equation. CO4-App (8+8)
(ii) A neutron of mass 1.675×10^{-27} kg is moving with a kinetic energy 10 keV. Calculate the de-Broglie wavelength associated with it.
19. (a) Derive an expression for density of electron states in a metal. Hence deduce the expression for Fermi energy at 0 K. CO3-App (16)
- Or
- (b) Deduce mathematical expressions for electrical conductivity and thermal conductivity of a conducting material and hence obtain Wiedemann-Franz law. CO3-App (16)
20. (a) Derive an expression for the electrical conductivity of an intrinsic semiconductor. CO1-U (16)
- Or
- (b) What is Hall effect? Derive an expression for Hall coefficient. Describe an experiment for the measurement of the Hall coefficient and mention its applications. CO1-U (16)

