Reg. No. : | | | | | | | | | | | | |

Question Paper Code: R1P03

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2025

First Semester

Computer science 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. A crystal has bcc structure and its lattice constant is 3.6 Å. What is the atomic radius? CO1-U

   (a) 3.6 Å (b) 1.56 Å (c) 1.27 Å (d) 1.80 Å

2. With the help of which of the following equations is the distance calculated from a known wavelength of the source and measured angle? CO1-U

   (a) Coolidge equation (b) Bragg's equation

   (c) Debye equation (d) Scherrer equation

3. Spherical wave front is received. CO2-U

   (a) Near the lighting tube light (b) Near the sun

   (c) When the light Wave is coming from sun to earth (d) All of the above

4. A monochromatic beam of x-rays of wavelength 1.24 angstrom is viewed at an angle of 60^0 to the direction of incidence. Find Compton shift. CO2-U

   (a) 0.002Å (b) 0.012Å (c) 0.012Å (d) 0.0111Å

5. Matter waves are not… waves CO2-U

   (a) electromagnetic (b) electric (c) mechanic (d) None of the above

6. In one dimensional problem the energy levels of a bound state system are . CO2-U

   (a) Discrete (b) Degenerate

   (c) Non Degenerate (d) Discrete & Non Degenerate

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 electron is moving with a drift velocity of 4 m/s from one end of the wire to other end due to the applied electric field 2 V/m. Calculate the mobility of e^{-S}. CO2-U

(a) 8 $m^2 V^{-1} s^{-1}$ (b) 4 $m^2 V^{-1} s^{-1}$ (c) 2 $m^2 V^{-1} s^{-1}$ (d) 0.5 $m^2 V^{-1} s^{-1}$

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 material emits photon during the transfer of electron from conduction band to valence band is CO1-U

(a) Silicon (b) Germanium (c) Gold (d) Gallium Arsenide

PART – B (5 x 2= 10 Marks)

11. What are Bravais Lattices? CO1-U

12. Why colours are formed in thin films? CO2-U

13. How is laser light different from an ordinary light? CO1-U

14. Define Fermi level and Fermi energy in metals with its importance. CO3-App

15. What are the differences between intrinsic & extrinsic semiconductor. CO3-App

PART – C (5 x 16= 80 Marks)

16. (a) A metallic crystal has a cubic structure. CO3-App (16)

(a) If the radius of an atom in the crystal is 0.125 nm and the crystal exhibits a body centered cubic (BCC) arrangement, calculate the edge length of the unit cell and its atomic packing factor (APF).

(b) For another metal with the same atomic radius but a face centered cubic (FCC) arrangement, calculate the edge length and atomic packing factor.

(c) Compare the packing efficiencies of the two structures and explain which structure allows closer atomic packing.

Or

(b) What are miller indices? Sketch two successive (110) planes. Show that for a cubic lattice the distance between two successive planes (hkl) is given by CO3- App (16)

$$d = \frac{a}{\sqrt{(h^2+k^2+l^2)}}$$

17.	(a)	Discuss the theory of interference of light due to thin films by reflection with suitable ray diagram.	CO2-U	(16)
		Or		
	(b)	Explain the modes of vibrations of CO_2 molecule. By applying this theory, describe the construction and working of CO_2 laser with necessary diagrams.	CO2-U	(16)
18.	(a)	(i) State de-Broglie's hypothesis. Derive an expression for de-Broglie wavelength, in terms of energy E and accelerating potential V.	CO1- U	(8)
		(ii) Explain the properties of matter waves	CO1- U	(8)
		Or		
	(b)	(i) Derive the Schrodinger's time independent wave equation	CO1-U	(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.	CO1-U	(8)
19.	(a)	(i) Deduce mathematical expressions for electrical conductivity and thermal conductivity of a conducting material.	CO1-U	(12)
		(ii) What are the advantages of quantum free electron theory over classical free electron theory?	CO1-U	(4)
		Or		
	(b)	Obtain an expression for the density of states and carrier concentration in metals.	CO1-U	(16)
20.	(a)	Derive an expression for concentration of holes (absence of electrons) in intrinsic semiconductors.	CO1-U	(16)
		Or		
	(b)	Give the theory of Hall effect. Show that for a n-type semiconductor the Hall coefficient R_H is given by -1/ne	CO1-U	(16)

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