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**Question Paper Code: R1P03**

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

First Semester

Computer science Engineering

R21UPH103- PHYSICS FOR INFORMATION SCIENCE

(Common to ALL CSE Allied branches)

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

- In the HCP crystal structure, the relation between  $c$  and  $a$  is CO1 -U  
(a)  $\sqrt{\frac{8}{3}}$                       (b)  $\sqrt{\frac{3}{8}}$                       (c)  $\sqrt{\frac{4}{3}}$                       (d)  $\sqrt{\frac{3}{4}}$
- 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
- Which of the following is the unique property of laser CO2-U  
(a) Monochromatic                      (b) directionality  
(c) coherence                      (d) all of these
- Rainbow is formed due to CO2-U  
(a) scattering                      (b) refraction                      (c) dispersion                      (d) reflection
- Matter waves are not ----- waves CO1-U  
(a) electro-magnetic                      (b) electric                      (c) magnetic                      (d) de-Broglie
- Calculate the momentum of photon of energy 3eV CO4-App  
(a)  $1.4 \times 10^{-27} \text{ kgms}^{-1}$                       (b)  $1.6 \times 10^{-27} \text{ kgms}^{-1}$                       (c)  $2.8 \times 10^{-27} \text{ kgms}^{-1}$                       (d)  $1.6 \times 10^{-20} \text{ kgms}^{-1}$
- The low resistive materials are also generally called as ----- materials CO1-U  
(a) Conducting                      (b) Non-conducting                      (c) Semi-conducting                      (d) Insulator

8. The material emits photon during the transfer of electron from conduction band to valence band is CO2-U

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

9. Semiconducting material has electrical conductivity between a good conductor and a CO1-U

- (a) Good insulator                      (b) Good metals                      (c) Good alloys                      (d) None of these

10. Free electrons move ----- through metallic crystal CO1-U

- (a) Periodic                      (b) Randomly                      (c) Properly                      (d) Order of sequence

PART – B (5 x 2= 10Marks)

11. What is meant by Unit cell? CO1-U

12. Find the wedge angle of a thin glass wedge of refractive index 1.52, fringe spacing is 0.1mm and wavelength of light is 5893Å CO5-App

13. State Wien's displacement law. CO1- U

14. Distinguish between relaxation time & Collision time. CO1-U

15. Differentiate direct and indirect band-gap semiconductors. CO1-U

PART – C (5 x 16= 80Marks)

16. (a) Obtain packing factors for SC, BCC and FCC lattices. CO1- U (16)

Or

(b) Describe the structure of a HCP crystal. Give details about its atomic radius, coordination number, axial ratio and packing factor. CO1- U (16)

17. (a) Derive an expression for the refractive index of a given liquid medium using the Newton's rings method. CO2- U (16)

Or

(b) Explain the modes of vibrations of CO<sub>2</sub> molecule. Describe the construction and working of CO<sub>2</sub> laser with necessary diagrams. CO2- U (16)

18. (a) Derive an expression for the change in wavelength of the scattered photon and compute the Compton shift for a scattering angle of  $\theta = 0$ , CO4- App (16)

Or

- (b) Derive the Eigen value of a particle in a one dimensional infinite box using the Schrodinger's wave equation and also find the energy values of the ground state and first excited state for the electron bound in one-dimensional box of width  $a=10^{-10}$  m. CO4- App (16)
19. (a) Deduce the expression for electrical conductivity and thermal conductivity in metals. Calculate the Lorentz number. CO1- U (16)
- Or
- (b) Evaluate the density of energy levels in a metal. Also deduce the expression for its carrier concentration. CO1- U (16)
20. (a) Obtain the expression for the electron concentration in an intrinsic semiconductor. CO1- U (16)
- Or
- (b) Develop an equation for the Hall coefficient for p-type and n-type semiconductors. Explain how the Hall field is connected to the Hall voltage. CO1- U (16)

