(b) Derive an expression for the density of electrons in the conduction band of an intrinsic semiconductor. 7

(c) Discuss the variation of the Fermi level with the temperature in the intrinsic semiconductor. 4

OR

10. (a) Describe the basic principle of n and p type semiconductors. 4

(b) Draw neat diagrams showing the location of the Fermi level in n-and p- type semiconductors. 3+3

(c) Write a short note on LED. 4

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B. Tech Odd Semester Examination, February, 2023

Agricultural Engineering /
Computer Science & Engineering /
Electronics & Communication Engineering
(1st Semester)

Course No.: ASH-101
(Engineering Physics)

Full Marks: 70
Pass Marks: 28

Time: 3 hours

Note: 1. Attempt 05 (Five) questions by taking one form each unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the right margin indicate full marks for the question.

UNIT-I

1. (a) What is conservative force? Give two examples of it. 2+1

(b) Write a short note on the conservation of angular momentum. 4

(c) What parameters determine theshape and size of an elliptic orbit of a planet? Explain in details. 7

OR

2. (a) What is simple harmonic motion? What is relaxation time? 2+1

(b) What is force oscillator? Develop differential equation for a Forced harmonic oscillator. Find thesolution of the differential equation for a Forced harmonic oscillator. 2+4+5

UNIT-II

3. (a) Describe in details about different types of the crystal system. 12

(b) The silver at room temperature is FCC with atoms of atomic radius 0.144 nm. Calculate the lattice constant a for the cube edge of the silver unit cell. 2

OR

4. (a) Write a short note on Bragg's law. 8

(b) What is miller indices? 2

(c) Explain the procedure followed to obtain the miller indices. 4

UNIT-III

5. (a) State and explain Heisenberg's uncertainty principle 4

(b) What is the hypothesis of de Broglie? 3

(c) Show that the group velocity of the de Broglie wave is equal to the velocity of the particle. 4

(d) Calculate de Broglie wavelength of electrons accelerated through a potential difference of 150 volt. Given $h=6.62\times10^{-27}$ *erg.sec*, $m=9.11\times10^{-28}$ *gm*, $e= 4.8\times10^{-10}$ *e.s.u.* 3

OR

6. (a) Why free electrons cannot exist in atomic nuclei? Explain in detail. 4

(b) A particle is free to move one dimensionally in a region of zero potential between two rigid walls at x=0 and x=a, (i) Find the position probability density in the n^{th} state. (ii) if E_n is the energy for the n^{th} state and ΔE_n is the energy separation between the (n+1) and the n^{th} state, show that 8+2

$$\frac{\Delta E_n}{E_n} = \frac{(2n+1)}{n^2}$$

UNIT-IV

7. Describe the Kronig-Penney model in detail. Draw schematically the energy vector diagram for crystal with its important features. What do you mean by reduced zone representation? 9+3+2

OR

8. (a) Define the term effective mass of an electron. 2

(b) What is crystal momentum? 3

(c) What is phonon? Write the characteristics of phonon. 2+4

(d) Explain the concept of holes. 3

UNIT-V

9. (a) Explain why resistivity increases with temperature in metal, while it decreases with temperature in semiconductors. 3