(b) What is miller indices? 2

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

(b) Show that the de Broglie wave length of a particle of rest mass m_0 and kinetic energy E_k is given by 5

$$\lambda = \frac{h}{\sqrt{2m_0E_k}}\left(1+\frac{E_k}{2m_0c^2}\right)^{-1/2}$$

5. (a) 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 nth state. (ii) if E_n is the energy for the nth state and ΔE_n is the energy separation between the (n+1) and the nth state, show that 8+2

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

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

(b) What is crystal momentum? 2

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

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

(b) Discuss the variation of the Fermi level with the temperature in the intrinsic semiconductor. 3

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

(b) Write a short note on LED. 4

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2022/MID/12/31/AE-501/201

B. Tech Odd Semester Examination, February, 2023

Agricultural Engineering / Computer Science & Engineering / Electronics & Communication Engineering

(1st Semester)

Course No.: ASH-101 (Arrear)

(Engineering Physics)

Full Marks: 50

Pass Marks: 25

Time: 2 hours

Note:
1. Attempt any five questions.
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.
6. All the mathematical symbols and abbreviations have their usual meanings.

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

(b) Develop differential equation for a simple harmonic oscillator. Find the solution of the differential equation for a Forced harmonic oscillator. 3+4

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

(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

3. (a) Write down the name of different types of the crystal system. 7