

Tribhuvan University
Institute of Science and Technology
2080
☆

Bachelor Level / First Year/ First Semester/ Science
Computer Science and Information Technology (PHY. 113)
(Physics)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

(OLD COURSE)

Candidates are required to give their answers in their own words as far as practicable.
The questions are of equal value.

Section A

Long Answer Questions.

Attempt any TWO questions.

[2×10=20]

1. What do you mean by the pn (p and n refers to hole and free electrons) junction? Use Fermi-Dirac statistics and Maxwell-Boltzmann distribution to show the flow of electrons from n to p is equal to the flow from p to n . Discuss the mobility of holes and electrons in the pn junction. [10]
2. Set up differential equation for an oscillation of a spring using Hooke's and Newton's second law. Find the general solution of this equation and hence the expressions for period, velocity and acceleration of oscillation. [10]
3. Describe Frank Hertz experiment. Why do we need to heat up the mercury in Franck-Hertz experiment? How does temperature affect the Franck-Hertz experiment? Interpret the result of the experiment. [10]

Section B

Short Answer Questions.

[8×5=40]

Attempt any EIGHT questions.

4. Discuss magnetic dipole moment. What is its effect on atom? and on molecules? Explain. [5]
5. Explain the process of semiconductor purification by describing the zone refining and single crystal growth. [5]
6. Explain the construction and working of TTL gate. [5]
7. You are spinning a 5 kg solid ball with a radius of 0.50 m. If it is accelerating at 4.0 radian/s^2 , what torque are you applying? [5]
8. An electron is placed midway between two fixed charges, $q_1 = 2 \times 10^{-10} \text{ C}$ and $q_2 = 6 \times 10^{-10} \text{ C}$. If the charges are 1 m apart, what is the velocity of the electron when it reaches a point 10 cm from q_2 ? [5]
9. What is the wavelength of an electron moving at $5.31 \times 10^6 \text{ m/sec}$? [Given: mass of electron = $9.11 \times 10^{-31} \text{ kg}$ and $h = 6.626 \times 10^{-34} \text{ Js}$.] [5]

10. What is the probability of finding a particle in a well of width a at a position $a/2$ from the wall if

$n = 1, 2, \text{ and } 3$. The normalized wavefunction is $\psi(x, t) = \left(\frac{2}{a}\right)^{\frac{1}{2}} \sin\left(\frac{n\pi x}{a}\right) e^{-\frac{iEt}{\hbar}}$ [5]

11. Sodium metal crystallizes in the bcc structure with an edge length of unit cell $4.29 \times 10^{-8} \text{ cm}$. Calculate the atomic radius of sodium metal. [5]

12. The output of a digital circuit (y) is given by this expression:

$$y = (BD + \bar{C}A)(\bar{B}\bar{A})$$

Where A, B, C and D represent inputs. Draw a circuit of above equation using OR, AND and NOT gate and hence find its truth table. [5]