PHY.113-2075 ✡

Tribhuvan University
Institute of Science and Technology
2075

✡

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

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

Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Attempt any two questions: (10×2=20)

1. Explain the process of semiconductor purification by describing the terms Zone refining, Single crystal growth, and scheme of IC production. Give an account of electronic component fabrication on a chip. (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. Discuss its result and outline limitations. (10)

Attempt any eight questions: (5×8=40)

4. Discuss magnetic dipole moment. What is its effect on atom and on molecules? Explain. (5)

5. Explain Bloch theorem? Discuss its use in Kronig-Penny model and hence in band theory. (5)

6. Explain the construction and working of bipolar junction transistor (BJT). (5)

7. A large wheel of radius 0.4 m and moment of inertia 1.2 kg-m2, pivoted at the center, is free to rotate without friction. A rope is wound around it and a 2-kg weight is attached to the rope. When the weight has descended 1.5 m from its starting position (a) what is its downward velocity? (b) what is the rotational velocity of the wheel? (5)

8. An electron is placed midway between two fixed charges, $q_1 = 2.5 \times 10^{-10}$ C and $q_2 = 5 \times 10^{-10}$ 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. A small particle of mass 10^{-6} gm moves along the x axis; its speed is uncertain by 10^{-6} m/sec. (a) What is the uncertainty in the x coordinate of the particle? (b) Repeat the calculation for an electron assuming that the uncertainty in its velocity is also 10^{-6} m/sec. Use the known values for electrons and Planck's constant. (5)

10. What is the probability of finding a particle in a well of width a at a position $a/4$ from the wall if $n = 1$, if $n = 2$, if $n = 3$. Use the normalized wavefunction $\psi(x,t) = \left(\frac{2}{a}\right)^{\frac{1}{2}} \sin\left(\frac{n\pi x}{a}\right) e^{\frac{iEt}{h}}$. (5)

11. Assuming that atoms in a crystal structure and arranged as close-packed spheres, what is the ratio of the volume of the atoms to the volume available for the simple cubic structure? Assume a one-atom basis. (5)

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

$$y = (CB + \overline{C}A)(\overline{BA})$$

where A, B and C represent inputs. Draw a circuit of above equation using OR, AND and NOT gate and hence find its truth table. (5)