

Tribhuvan University
Institute of Science and Technology
2081

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Bachelor Level / First Year/ First Semester/ Science

Computer Science and Information Technology (PHY. 113)

(Physics)

(OLD COURSE)

Full Marks: 60

Pass Marks: 24

Time: 3 hours.

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. Use Hooke's and Newton's second law to set up differential equation for an oscillation of a spring. Find the general solution of this differential equation and hence obtain the expressions for period, velocity and acceleration of the oscillation. [10]
2. Describe construction and working principal of Frank Hertz experiment. Interpret its result. What is the conclusion of Franck-Hertz experiment? Explain. [10]
3. Use Fermi-Dirac statistics and Maxwell-Boltzmann distribution to show the flow of electrons from junction n to p is equal to the flow from junction p to n . How electron current from p to n (due to minority carriers) is not affected by the height of the potential energy barrier? Explain. [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. How memory and clock circuits can be made by using RTL and TTL gates? Explain. [5]
6. Explain Hall effect and discuss the importance of Hall voltage while manufacturing electronic devices. [5]
7. A children's merry-go-round of radius 4 m and mass 100 kg has an 80-kg man standing at the rim. The merry-go-round coasts on a frictionless bearing at 0.2 rev/sec. The man walks inward 2 m toward the center. What is the new rotational speed of the merry-go-round? What is the source of this energy? (The moment of inertia of a solid disk is $I = \frac{1}{2}mr^2$). [5]
8. An alpha particle is moving with a velocity $\mathbf{v} = (3 \times 10^4 \mathbf{i} + 4 \times 10^4 \mathbf{k})$ m/sec in a region where there is a magnetic field $\mathbf{B} = 0.5\mathbf{j}$ T. Find the force experienced by the alpha particle. [5]
9. The de Broglie wavelength of a proton is 10^{-13} m. Use the known values of Planck's constant and mass of the proton to find speed of the proton. Through what potential difference must the proton be accelerated to acquire such a speed? [5]
10. Explain why the following eigenfunction $y(x) = A e^{ikx}/x$ is not acceptable solutions of the Schrodinger equation. [5]
11. Assuming that atoms in a crystal structure are 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:

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

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]