

Tribhuvan University
Institute of Science and Technology
2077
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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 far as practicable.
The questions are of equal value.

Group A

Long Answer Questions:

Attempt any TWO questions

(2x10=20)

1. Explain RTL and TTL gates. How memory and clock circuits can be made by using these gates? Explain how they work?
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.
3. Describe Frank-Hertz experiment. Interpret how the results of this experiment advocate atomic model proposed by Bohr?

Group B

Short Answer Questions:

(8x5=40)

Attempt any EIGHT questions:

4. Discuss magnetic dipole moment. What is its effect on atom? and on molecules? Explain.
5. Describe the following process of IC production: (a) Oxidation, (b) Pattern definition, and (c) Doping.
6. Explain the construction and working of bipolar junction transistor (BJT).
7. A roulette wheel with moment of inertia $I = 0.5 \text{ kg m}^2$ rotating initially at 2 rev/sec coasts to a stop from the constant friction torque of the bearing. If the torque is 0.4 Nm, how long does it take to stop?
8. Two large parallel plates are separated by a distance of 5 cm. The plates have equal but opposite charges that create an electric field in the region between the plates. An α particle ($q=3.2 \times 10^{-19} \text{ C}$, $m= 6.68 \times 10^{-27} \text{ kg}$) is released from the positively charged plate, and it strikes

the negatively charged plate 2×10^{-6} sec. later. Assuming that the electric field between the plates is uniform and perpendicular to the plates, what is the strength of the electric field?

9. In neutron spectroscopy a beam of monoenergetic neutrons is obtained by reflecting reactor neutrons from a beryllium crystal. If the separation between the atomic planes of the beryllium crystal is 0.732 \AA , what is the angle between the incident neutron beam and the atomic planes that will yield a monochromatic beam of neutrons of wavelength 0.1 \AA ?

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 $\psi(x, t) = \left(\frac{2}{a}\right)^{\frac{1}{2}} \sin\left(\frac{n\pi x}{a}\right) e^{-\frac{iEt}{\hbar}}$.

11. The energy gap in silicon is 1.1 eV , whereas in diamond it is 6 eV . What conclusion can you draw about the transparency of the two materials to visible light (4000 \AA to 7000 \AA)?

12. Find the truth table for the circuit shown in the figure. What logic function will the circuit perform if the constant $+5 \text{ V}$ input to the first two gates is changed to ground potential?

