

# CENTRAL INSTITUTE OF TECHNOLOGY KOKRAJHAR

(Deemed to be University)

KOKRAJHAR :: BTR :: ASSAM :: 783370

## END – SEMESTER EXAMINATION

### DIPLOMA

Session: July-December 2024

Semester: 1<sup>st</sup>

Time: 3Hrs.

Full Marks: 100

Course Code: DPH 101

Course Title: Applied Physics-I

### ANSWER ANY FIVE QUESTIONS

1. Answer the following questions (2×10=20)
  - i. What is the meant by dimensions of a physical quantity?
  - ii. Write the dimensional formula of Kinetic energy.
  - iii. Suppose for a dimensionally correct equation,  $A = Bt$ , where A, B represent certain physical quantities. If A has the dimension of distance, what will be the dimension of B?
  - iv. What is the magnitude of the vector product of two mutually perpendicular vectors  $\vec{A}$  and  $\vec{B}$ ?
  - v. Define impulse of a force.
  - vi. If the velocity is doubled, what would be increase in kinetic energy?
  - vii. What is the unit of G?
  - viii. Define work.
  - ix. What is centripetal force?
  - x. Give an example of conservation of linear momentum.
2.
  - (a) State the parallelogram law of vector addition. (2)
  - (b) State the Newton's three laws of motion. (3)
  - (c) Establish a relation between linear and angular velocity. (5)
  - (d) What is centripetal Force? Obtain the formula for bending of a cyclist in a curved path. (5)
  - (e) A cycle can bend upto a maximum angle of 45°. If the radius of the bend is 10 m, then what should be the maximum speed of the cyclist so that he does not crash? (5)
3.
  - (a) What is an oscillatory and non-oscillatory motion? (2)
  - (b) What is a Simple Harmonic motion? What does phase of a particle executing simple harmonic motion represent? (3)
  - (c) Write a detailed note on simple pendulum with its formula for time period. Draw a graph of the variation of potential energy, kinetic energy and total energy with displacement from equilibrium position. (5)
  - (d) Show that the law of conservation of energy is applicable for a free-falling body. (5)
  - (e) Calculate the potential energy of a body mass of 300 Kg at a height of 100 m from the ground. What would be its kinetic energy at a height of 50m if the body would be allowed to fall down freely. (5)
4.
  - (a) Define Universal Gravitation Constant. What is its value? (2)
  - (b) Obtain the relation between 'g' and 'G' if g and G respectively represent acceleration due to gravity and Universal Gravitation Constant. (3)
  - (c) Discuss the variation of acceleration due to gravity with altitude. (5)
  - (d) Discuss the variation of acceleration due to gravity with depth. (5)
  - (e) What is the force of gravity acting on an object of mass 1000 kg at 20,000 meters above the Earth's surface? Assume that the mass of the earth is  $5.98 \times 10^{24}$ kg and radius of earth is  $6.38 \times 10^6$ m. (5)
5.
  - (a) What is difference between elastic and plastic body? (3)
  - (b) Define the Longitudinal, normal and shearing stress. (6)
  - (c) Define Hooke's law and modulus of elasticity. (5)
  - (d) What is the coefficient of linear and volume expansion. Discuss them in detail. (6)
6.
  - (a) If a substance is at 450C, express its value in Fahrenheit scale and Kelvin Scale. (5)
  - (c) Define the latent heat of vaporization. (3)
  - (d) Discuss different modes of heat transfer (12)

7. (a) A sound wave has a frequency of 3 mega-Hz and wavelength of 3 milli-meters. Calculate the velocity of this wave. (5)
- (b) What is the difference between Echo and Reverberation. (6)
- (c) Write down the applications of ultrasound waves (4)
- (d) A ship sends out ultrasound that returns from the seabed and is detected after 4s. If the speed of ultrasound through the seawater is 1352 m/s, what is the distance of the seabed from the ship? (5)

