Total No. of printed pages = 6

END SEMESTER (REGULAR/RETEST) EXAMINATION, JUNE – 2024

Semester : 1st (New)

Subject Code : Sc-104

APPLIED PHYSICS – I

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

(i) Question Nos. 1, 2 and 3 are compulsory.

(ii) Answer any *five* questions from the rest.

1. Fill in the blanks : 1×5=5

   (a) Magnitude of a unit vector is ____.

   (b) Rate of change of velocity is known as ____.

   (c) 283K = ____°C.

   (d) The SI unit of angular momentum is ____.

   (e) The audible range for humans is ____.

[Turn over

2 Write whether True or False : 1×5=5

(a) Strain is a dimensionless quantity.

(b) The value of g increases with increasing height from the earth's surface.

(c) Kinetic Energy can have negative values.

(d) Heat is measured by thermometer.

(e) $1\text{kWh} = 3.6 \times 10^6\text{J}$.

3 Choose the correct answers : 1×5=5

(a) Weight of an object becomes zero at

(i) Centre of Earth

(ii) Surface of Earth

(iii) 1km above Earth

(iv) All of the above

(b) Coefficient of linear expansion is denoted by

(i) β (ii) α

(iii) γ (iv) None of these

(c) According to Boyle's Law

(i) $P \propto \frac{1}{V}$ (ii) $P = V$

(iii) $P \propto V$ (iv) None of these

(d) Which one is a good conductor of heat ?

(i) Metal (ii) Alloy

(iii) Non-metal (iv) Metalloids

(e) 18 km/h is equivalent to

(i) 10 m/s (ii) 100 m/s

(iii) 5 m/s (iv) 3.6 m/s.

4. (a) Define fundamental units. Give example. 1+1=2

(b) Check whether the following equation is dimensionally correct or not 2

$$v^2 = u^2 + 2as.$$

(c) Find the magnitude of a vector $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$. 1

(d) State the three Newton's Law of Motion. 3

(e) A train starting from rest achieves a uniform speed of 54 km/h in 40 seconds. Calculate the distance covered in this span of time. 3

5. (a) Define error. Find the percentage error in the volume of cube if the error in measurement of length of cube is 4%. 1+2=3

(b) State the Law of conservation of linear momentum. 2

(c) Define time period and frequency for circular motion. Also, find an expression to relate time period and frequency. 1+1+1=3

(d) Differentiate between Kinetic and Potential Energy. 3

6. (a) Define Escape Velocity and Orbital Velocity. Derive a relationship between each other. 1+1+1=3

(b) Find the expression for variation of g with altitude. 3

(c) A wire of 1m length and cross-sectional area 1 mm^2 elongates by 1 mm when a load of 10 kg is applied to it. Find the Young's modulus of the material of the wire. 3

(d) Define work and energy. 1+1=2

7. (a) Differentiate between boiling and evaporation. 3

(b) Show that coefficient of superficial expansion (β) is twice the coefficient of linear expansion (α). 3

(c) Differentiate between conduction and radiation. 2

(d) Differentiate between Centripetal force and Centrifugal force. 3

8. (a) What do you mean by pressure ? Write the unit of pressure. Derive an expression for the atmospheric pressure at a point on earth. 1+1+2=4

(b) Write the differences between temperature and heat. 2

(c) Define specific heat. Also, find the amount of heat required to raise the temperature of 10 kg of water from 20°C to 30°C. *(Specific heat of water is 1 cal/g°C)* 1+2=3

(d) Write two applications of ultrasound. 2

9. (a) Write the differences between longitudinal and transverse waves. 2

(b) A tuning fork is vibrating at 300 vibrations/sec. Find the wavelength of the sound wave if wave velocity is 330 m/s. 2

(c) State Newton's law of gravitation. 2

(d) State Zeroth and First Law of Thermodynamics. 2

(e) Prove that total mechanical energy of a falling object remains constant. 3

10. (a) A ball of 50g attains a velocity of 20 m/s. Find its momentum and kinetic energy. 1+2=3

(b) Write short notes on : 2×4=8

(i) Propagation of sound waves

(ii) Anomalous expansion of water

(iii) Working of Siphon

(iv) Working of Hydraulic Jack.