Total No. of printed pages = 8

END SEMESTER (REGULAR/RETEST) EXAMINATION, DECEMBER – 2023

Semester : 1st

Branch : All

Subject Code : Sc-104

APPLIED PHYSICS – I

Full Marks – 70

Time – Three hours

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

Instruction :

- Answer Question No.1 and any 5(*five*) from the rest.

1. A. Fill in the blanks :   1×5=5

   (a) The dimensional formula of moment of inertia is _____.

   (b) The significant figure of the measured length of 0.05400 is _____.

(c) In a circular motion, the linear velocity is equal to the product of angular velocity and _____.

(d) Gravity is the special case of _____.

(e) Actual vapor pressure at a certain temperature is equal to saturated vapor pressure at a certain lower temperature. This lower temperature is known as _____.

B. Choose the correct answers :   1×5=5

(a) Which of the following is not a fundamental unit ?

(i) Newton   (ii) Kelvin

(iii) Ampere   (iv) Meter

(b) A thermometer when put in a water bath of 27°C reads 300. The scale of thermometer is

(i) Reaumur   (ii) Fahrenheit

(iii) Kelvin   (iv) Faulty thermometer

(c) A particle is moving in a circle with uniform speed. It has constant

    (i) acceleration   (ii) velocity

    (iii) kinetic energy   (iv) displacement

(d) Two wires A and B are of the same length. The diameters are in the ratio 1 : 2 and the Young's modulus is in the ratio 2 : 1. If they are pulled by the same force then their elongation will be in the ratio

    (i) 1 : 2   (ii) 2 : 1

    (iii) 4 : 1   (iv) 1 : 4

(e) When water is heated from 0°C to 100°C, it's volume

    (i) increases

    (ii) first increases then decreases

    (iii) decreases

    (iv) first decreases then increases.

C. Write True or False :   1×5=5

(a) In a hydraulic press, the piston of pump as compared to press plungers should have same radius.

(b) When a body starts from rest, then its final velocity is equal to the product of acceleration with time.

(c) Universal law of Gravitation was able to successfully explain the motion of the moon around the earth.

(d) The specific gravity of a body indicates how many times the body is heavier than an equal volume of water.

(e) When the listener approaches the source of sound, the pitch of sound decreases.

2. (a) Define unit. Write the supplementary S.I units.   1+1=2

(b) Define systematic error. A physical quantity P is related four observables a, b, c and d as follows :

$$P = \frac{a^3 b^2}{d\sqrt{c}}.$$

The percentage errors of measurement in a, b, c, and d are 1%, 3%, 4% and 2% respectively. What is the percentage error in the quantity P ?   1+3=4

(c) (i) Define scaler and vector quantity with examples. 3

(ii) State dot product of two vectors A and B. Give one practical example of dot product. 1+1=2

3. (a) State Newton's Second law of motion. How force is measured from Newtons second law. 1+2=3

(b) A truck starting from rest maintains a constant acceleration of 10 cm/sec^2. How long it will take the truck to go 2 km ? 3

(c) A fly wheel of mass 500 kg and one meter of radius makes 500 revolutions per minute. Assuming the mass to be concentrated along the rim, calculate the angular velocity and kinetic energy of the fly wheel. 3

(d) State the characteristics of a simple harmonic motion. 2

4. (a) (i) State Hook's Law. What is elastic limit ? 1+1=2

(ii) A wire of length 1.5 metre and area of cross-section 1 sq.mm increases by 1.55m when stretched by a weight of 20 kg. Find the Young's modulus of the material. 3

(b) Explain how steel is more elastic than rubber.

2

(c) What are the conditions for working of a siphon ?

2

(d) Define centripetal force. What is super elevation ? 1+1=2

5. (a) (i) State Pascal's Law. How can the principle of multiplication of force is obtained from this law ? 1+3=4

(ii) Write the difference between musical sound and noise. 2

(b) (i) State Doppler's effect.

(ii) Calculate the frequency of a radio wave of wavelength 160m moving with velocity 330 m/s. 1+2=3

(c) State Newton's formula for velocity of sound in a gas. How velocity of sound varies with humidity or moisture ? 1+1=2

6. (a) Define coefficient of thermal conductivity and thermal capacity. 1+1=2

(b) **(i)** State Joules Law of heating and hence define mechanical equivalent of heat.

$$1+1=2$$

(ii) Explain anomalous expansion of water with graph. 2

(c) 90 gm of mercury at 100°C is mixed with 100 gm of water at 20°C. If the resulting temperature is 22°C. What is specific heat capacity and water equivalent of mercury ?

3

(d) Define coefficient of linear expansion. Write its S.I unit. 2

7. **(a)** Define torque and angular momentum. 2

(b) Show that the sum of kinetic energy and potential energy of a falling body is constant at all points of its motion. 3

(c) An artificial satellite is revolving round the earth at a height of 600 km. Calculate orbital velocity. Radius of the earth is 6400 km and $g = 9.8$ m/s^2. 2

(d) **(i)** State Newton's Law of gravitation. 1

(ii) Define escape velocity. Obtain an expression for the escape velocity of a body from the surface of the earth.

$$1+2=3$$

Or

Derive an expression for variations of 'g' at a height h from the surface of the earth. 3

8. (a) Explain the effect of pressure on melting point. 2

   (b) What do you mean by latent heat of fusion and latent heat of vaporization ? 3

   (c) Write two differences between conduction and radiation. 2

   (d) Write short notes on : 2+2=4

      (i) Echo

      (ii) Reverberation.