Total No. of printed pages = 8

Sc-104/AP-I/1st Sem/2018/M

APPLIED PHYSICS – I

(New Course)

Full Marks – 70

Time – Three hours

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

PART – A

Marks – 25

All questions are compulsory.

1. Fill in the blanks : 1×8=8

   (a) $M^0L^0T^{-1}$ represents a pair of physical quantities, one is frequency and the other is ———.

   (b) The absolute error is the difference between the true value and the ——— value of a quantity.

   (c) Work is a ——— quantity.

[Turn over

(d) The value of acceleration due to gravity is ——— at the poles .

(e) The melting point of ice is ——— ^{o}F .

(f) The velocity of sound in moist air is ——— than in dry air.

(g) In SHM, acceleration is ——— proportional to displacement.

(h) Rubber is ——— elastic than steel .

2. Choose the correct answer : $1 \times 8 = 8$

(i) Which one of the following is not a derived unit ?

(a) gm wt (b) ampere

(c) joule (d) hertz

(ii) Two forces of equal magnitude act at right angles to each other. The angle of the resultant with each of them is

(a) 90^{o} (b) 45^{o}

(c) 60^{o} (d) 30^{o}

(iii) A body is dropped from the top of a tower and it reaches the ground in 4 seconds. The height of the tower is

(a) 39.2 m (b) 19.6 m

(c) 78.4 m (d) 98 m

(iv) The significant figure of 156.000 is

(a) 3 (b) 7

(c) 6 (d) 4

(v) A bullet of mass 0.01 kg is fired from a rifle of mass 10 kg with a speed of 200 m/s. The velocity of recoil of the rifle is

(a) 20 m/s (b) 2 m/s

(c) 0.2 m/s (d) 0.02 m/s

(vi) The scale of temperature which is the most sensitive is

(a) Centigrade (b) Kelvin

(c) Fahrenheit (d) Reaumur

(vii) Water is used in hot water bags because

(a) it has the lowest specific heat

(b) it has the highest specific heat

(c) it is not related to specific heat

(d) it has the highest thermal capacity

(viii) With the increase of pressure, the velocity of sound

(a) increases

(b) decreases

(c) remain unchanged

(d) first increases and then decreases

3. State whether the following statements are true or false : 1×5=5

(i) Joule is the SI unit of work.

(ii) The escape velocity of a body from the earth's surface is less than the orbital velocity of the body.

(iii) Young's modulus is numerically equal to the stress required to double the length of the wire.

(iv) Siphon is a device used to transfer liquid from a high level to a low level.

(v) Water equivalent of a body is measured in calorie.

4. Define any *four* of the following in one or two lines each : 1×4=4

Inertia, Centrifugal force, Work, Poisson's ratio, Water equivalent, Coefficient of thermal conductivity.

PART – B

Marks – 45

Answer any *five* questions.

5. (a) What do you mean by dimension of a physical quantity ? 1

(b) Write the supplementary quantities with their SI units. 1

(c) Deduce an expression for the resultant of two vectors inclined to each other at an angle θ. 3

(d) A stone is dropped from the top of a tower and is found to travel 24.5 meter in the last second before it reaches the ground. Find

(i) the height of the tower

(ii) the velocity with which it strikes the ground. 2+2=4

6. (a) State Newton's second law of motion and hence define force. 2

(b) What do you mean by impulse ? State its unit. 2

(c) Deduce an expression for the angle of bending of a cyclist on a curved path. 4

(d) What is super elevation ? 1

7. (a) Define work, power, energy and state their SI units. 3

(b) What do you mean by a second's pendulum ? 1

(c) Explain escape velocity and orbital velocity in relation to earth's gravity. 2

(d) Find the mass of the earth, given that the radius of the earth is 6.4×10^{6} m and $G = 6.67 \times 10^{11}$ SI units. 3

8. (a) Determine the force required to double the length of a steel wire of cross sectional area 0.5 cm^2. The Young's modulus for steel is 2×10^{11} Nm^{-2}. 3

(b) State Pascal's law for transmission of liquid pressure. Hence define multiplication of forces. 1+2=3

(c) Explain how Archimedes' principle is used to determine the specific gravity of a body. 2

(d) How is atmospheric pressure measured ? 1

9. (a) The reading of a certain temperature on the Centigrade scale is half the reading on the Fahrenheit scale. Find the reading on the Centigrade scale. 3

(b) Explain anomalous expansion of water. How does it explain the density of water ? 2

(c) State the principle of calorimetry. 1

(d) Calculate the amount of heat required to convert 10 gms of ice at $-10^{o}C$ completely to steam. Specific heat of ice = 0.5 cal/gm ^{o}C. 3

10. (a) What do you understand by the statement "Latent heat of vaporization of water is 540 cal/gm" ? 2

(b) What is ultrasonic sound ? Mention one of its uses. 1+1=2

(c) A tuning fork of frequency 640 Hz produces a sound which travels with velocity 320 m/s. Find the wavelength and time period of the wave. 2

(d) State and explain the characteristics of musical sound. 3