Total No. of printed pages = 7

Sc-104/AP-I/1st Sem/2015/M

APPLIED PHYSICS - I

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer question No.1 and any *five* from the rest.

1. Choose the correct answers of the following : $1 \times 10 = 10$

(i) The dimensional formula of pressure is

(a) MLT^{-2} (b) $ML^2 T^{-2}$

(c) $ML^{-1} T^{-2}$ (d) $ML^{-1} T^{-1}$

(ii) Which of the following is the unit of power ?

(a) Newton (b) Watt

(c) Joule (d) Hertz

[Turn over

(iii) Which of the following systems of units has seven base units ?

(a) CGS system (b) FPS system

(c) MKS system (d) SI

(iv) Transmission of heat by molecular collision is —

(a) Conduction (b) Convection

(c) Radiation (d) Scattering

(v) The velocity of sound in air is independent of change in

(a) Pressure (b) Density

(c) Temperature (d) Humidity

(vi) Principle of transmission of pressure in liquid is stated by —

(a) Newton's law

(b) Boyle's law

(c) Gauss's law

(d) Pascal's law

(vii) Weight of a body is maximum at

(a) Equator of the earth

(b) Pole of the earth

(c) Centre of the earth

(d) None of the above

(viii) Which of the following is a dimensionless quantity ?

(a) Power (b) Angle

(c) Density (d) Pressure

(ix) The magnitude of centripetal acceleration acting on a body moving with uniform speed 'v' in a circular path of radius 'r' is —

(a) $\frac{v^2}{r^2}$ (b) $\frac{r}{v^2}$

(c) $\frac{v^2}{r}$ (d) $=\frac{r^2}{v^2}$

(x) Increase of pressure over the surface of ice

(a) does not affect the melting point

(b) increases the melting point

(c) decreases the melting point

(d) None of the above

2. (a) Distinguish between scalar and vector quantities. 2

(b) State Newton's second law of motion. Deduce a relationship between the cause of motion and its effect. 4

(c) Deduce the dimensional formula for the following physical quantities : 2

(i) Gravitational constant

(ii) Young's modulus.

(d) A stone is dropped into a well of depth 45m. The sound of splash is heard after 3·125 sec. Find the velocity of sound in air. (Take $g = 10m/s^2$) 4

3. (a) What do you understand by scalar product and vector product of two vectors ? 4

(b) State Hooke's law and hence define Young's modulus of elasticity. What is elastic limit ? Mention different types of strains. 2+1+1=4

(c) What force is required to stretch a steel wire to double its length when its area of cross-section is 1 sq.cm and Young's modulus is 2×10^{11} N/m^2 ? 4

4. (a) Derive a relation between angular and linear velocities. 3

(b) A stone fixed at the end of a string 50 cm long is whirled around. It makes 8 revolutions in 2 sec. What is the angular velocity in radian per sec ? 4

(c) Distinguish between mass and weight. 3

(d) Define the unit of force in the C.G.S and S.I system of units. State the relation between them. 2

5. (a) Define transverse waves and longitudinal waves. Deduce the relationship between wavelength and frequency. 3+2=5

(b) A tuning fork is vibrating with a frequency of 400 vibrations per sec. If the velocity of sound is 330 m/s, find the distance travelled by the sound in 20 vibrations. 3

(c) Define echo and reverberation. 4

6. (a) Why the roads are banked ? Deduce an expression to calculate the angle of banking of roads. 4

(b) Distinguish between sensible heat and latent heat. 3

(c) Calculate the total heat required to change 50 gm of ice at $-20^{\circ}C$ to steam at $140^{\circ}C$. Sp. heat of ice and steam is 0·5. Latent heat of fusion of ice = 80 cal/gm and latent heat of vaporisation of steam = 540 cal/gm. 4

(d) Define dew point. 1

7. (a) State and explain Newton's laws of gravitation. 3

(b) What is the effect of altitude and depth of the earth on the value of g ? 4

(c) During the oscillation of a simple pendulum, at which position is : 2

(i) the velocity of the bob maximum ?

(ii) the acceleration of the bob maximum ?

(d) The volume of a lead ball is 100 c.c at 0°C and 100·85 c.c at 100°C. Calculate the co-efficient of linear expansion. 3