Total No. of printed pages = 6

Sc-104/AP-I/1st Sem/2013/N

APPLIED PHYSICS – I

Full Marks – 70

Pass Marks – 21

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. A. Choose the correct answer from each of the following : 1×5=5

(a) Which of the following quantities is a scalar ?

(i) mass

(ii) velocity

(iii) momentum

(iv) displacement

(b) The dimensional formula for force is

(i) $M^1L^1T^{-2}$

(ii) $M^1L^2T^{-2}$

(iii) MLT^{-3}

(iv) $M^{-1}LT^2$

[Turn over

(c) Pressure at any point inside a liquid is

(i) directly proportional to density

(ii) inversely proportional to density

(iii) directly proportional to volume

(iv) inversely proportional to temperature

(d) The momentum is equal to

(i) mass × velocity

(ii) force × acceleration

(iii) force × time

(iv) force × distance

(e) The Young's modulus of the material of a wire of length L and radius r is Y. If the length of the wire be reduced to L/2 and radius be reduced to r/2, the value of the Young's modulus will be

(i) Y/2

(ii) Y/4

(iii) 4Y

(iv) Y

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

(a) The velocity of sound in moist air is less than that in dry air.

(b) The SI unit of power is Watt.

(c) The quantity of heat required to increase the temperature of unit mass of a substance by unit degree is called the latent heat.

(d) When water is heated from 0°C to 100°C, its volume remains unchanged.

(e) The value of acceleration due to gravity is the same everywhere in the universe.

2. (a) What do you mean by the unit of a physical quantity ? Write down the fundamental units in SI with their symbols 1+2=3

(b) What is the difference between a scalar and a vector quantity ? State dot product of two vectors A and B and mention one practical example of dot product. 2+1+1=4

(c) State Newton's second law of motion and hence find a relation between force and its effect. 1+2=3

(d) Define momentum and impulse. 2

3. (a) Define circular motion and angular velocity. 2

(b) Define centripetal force and derive the relation $\tan\theta = \frac{v^2}{rg}$ (where the symbols have their usual meanings). 1+3=4

(c) Define work, power and energy and write their SI units. 3

(d) A body of mass 5 kg moving at a speed of 20 m/s accelerates at 3 m/sec^2 for 5 seconds. Find its final kinetic energy. 3

4. (a) State Newton's law of gravitation and hence define gravitational constant and write the dimensions of G. 2+1+1=4

(b) Define stress, strain and elastic limit. What is Young's modulus of elasticity ? What is its unit in SI ? 3+1+1=5

(c) A wire of length 1m is stretched by a force of 10N. The cross-sectional area of the wire is $2 \cdot 10^{-6} m^2$, and the Young's modulus of elasticity of the material of the wire is $2 \cdot 10^{11}$ N/m^2. Calculate the increase in length of the wire. 3

5. (a) What are the different modes of transmission of heat ? Which of them does not require any material medium ? 3+1=4

(b) Define : calorie, specific heat and thermal capacity. 3

(c) 'Lalent heat of fusion of ice is 80 cal/gm'. Explain the statement. 2

(d) Define coefficient of linear expansion of solid. Does it depend on the unit of length and the scale of temperature ? 2+1=3

6. (a) State Pascal's law of transmission of pressure through liquid. Explain the principle of multiplication of force. 2+2=4

(b) Distinguish between evaporation and boiling. 2

(c) What will be the final temperature of the mixture when 10 gms of ice at 0° is mixed with 50 gms of water at 50°C. 3

(d) State Joule's law of heating. Write the SI unit of J. 2+1=3

7. (a) What is musical sound ? Write the characteristics of musical sound. 1+3=4

(b) Write the difference between echo and reverberation. 2

(c) What is Laplace's correction of Newton's formula for the velocity of sound in a gas ? Why was the correction necessary ? 3+1=4

(d) Calculate the frequency of a radiowave of wavelength 160 meter moving with velocity 330 m/s. 2