Total No. of printed pages = 6

Sc-104/AP-I/1st Sem/2014/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) Fill in the gaps with appropriate words : 1×5=5

(a) The product of mass and acceleration of a body is ———.

(b) The S.I unit of power is ———.

(c) The latent heat of fusion of ice is ———.

(d) There are ——— processes of heat transmission.

(e) Speed of sound in a moist air is —— than in dry air.

[Turn over

(B) Select the correct answer in each of the following : $1 \times 5 = 5$

(a) Which of the following is not a vector quantity ?

(i) momentum

(ii) force

(iii) acceleration

(iv) power

(b) The dimension of work is

(i) MLT^{-2}

(ii) $M^1L^2T^2$

(iii) $M^1L^2T^2$

(iv) ML^2T^{-3}

(c) When the listener approaches the source of sound, the pitch of the sound

(i) increases

(ii) remains the same

(iii) decreases

(iv) none of the above

(d) The quantity of heat required to increase the temperature of a substance by unit degree is called

(i) latent heat

(ii) specific heat

(iii) thermal capacity

(e) Which of the following is S.I unit of force ?

(i) Joule

(ii) Erg

(iii) Newton

(iv) Watt

2. (a) Define scalar or dot product of two vectors. Mention one example. 3

(b) Distinguish between mass and weight of a body. 2

(c) A car moving with uniform acceleration describe 65m in 5th second and 105m in the 9th second. Calculate the initial velocity and acceleration of the car. 3

(d) State Newton's second laws of motion and hence establish a relation, F = ma. 2+2=4

3. (a) Define work, power and energy. Write down the S.I unit of each of them. 3

(b) Deduce a relation between linear velocity and angular velocity. 3

(c) Distinguish between a scalar and a vector quantity. Mention four vector quantities. 2+2=4

(d) Calculate the P.E of a stone of mass 25 gm at a height of 5 metres from the ground. (Given, acceleration due to gravity at that place, $g = 9.8\ m/s^2$) 2

4. (a) State and explain Newton's law of gravitation with mathematical expression. Define universal gravitational constant. 3+1=4

(b) Show that the mechanical energy of a free falling body under gravity remains constant. 5

(c) State and explain Pascal's law of transmission of pressure through liquid. 3

5. (a) Differentiate between heat and temperature. 3

(b) Define water equivalent, thermal conductivity and mechanical equivalent of heat. 3

(c) State co-efficient of linear, superficial and volume expansion of solid. 3

(d) An iron ball weighing 100 gm and heated to 98.5°C are dropped in a calorimeter weighing 46 gm and containing 85.4 gm of water at 15°C. The final temperature of the mixture becomes 22°C. Calculate the specific heat of iron. (Given, specific heat of calorimeter material = 0.1) 3

6. (a) Define stress and strain and state their units. What is elastic limit ? 2+1=3

(b) A wire of length 5 metre and diameter 4 mm is loaded with 80 kg. If the elongation is 1.3 mm, find the Young's modulus of the material of the wire. 3

(c) What is Archimedes' principle ? Will it be applicable for a freely falling body ? What is the relationship between specific gravity and density ? 2+1+2=5

(d) State Doppler effect of sound. 1

7. (a) Write down Newton's formula for the velocity of sound in air. Explain Laplace's correction. 1+3=4

(b) What are the characteristics' of musical sound ? Explain briefly each of them. 4

(c) What are transverse and longitudinal waves ? 2

(d) Calculate the frequency of a note of sound moving with velocity 330m/s and wave length 165m. 2