DSA – 210 (F)

First B.Sc. Degree Examination, August/September 2008
Directorate of Correspondence Course
PHYSICS (Freshers)
Paper – I : Mechanics, Properties of Matter, Heat and Thermodynamics

Time : 3 Hours | Max. Marks : 80

SECTION – A

I. Answer **all** the questions : **(9×1=9)**

1) Write the expression for angular momentum in vector form.

2) Give an example for inertial frame of reference.

3) Define co-efficient of restitution.

4) What is a geo-stationary satellite ?

5) Define Poisson's ratio.

6) What is stream line motion ?

7) Why rain drops assume spherical shape only while falling down ?

8) State Camot's theorem.

9) What is the drawback of Rayleigh-Jean's law ?

SECTION – B

II. Answer **any FIVE** questions : **(5×3=15)**

10) If $\vec{A} = 5\hat{i} + 6\hat{j} - 4\hat{k}$ and $\vec{B} = 2\hat{i} + 3\hat{j}$, deduce the angle between them.

11) What are the uses of artificial satellites ?

12) Show that ratio of two specific heat for diatomic gas is 1.4

13) Give reasons why practical heat engines cannot be considered as ideal heat engines.

14) What is entropy ? Give your explanation in support of the statement "Universe is marching towards heat death".

15) State Galilean principle of relativity. Write the Galilean transformation equations.

16) Define surface energy. Explain why liquid surface always acts as a stretched elastic membrane.

SECTION – C

III. Answer **any SIX** questions : **(6×6=36)**

17) What are inertial and non-inertial frames of reference ? Show that accelerated frame is a non-inertial frame.

18) Write the expressions for radial and transverse components of velocity and acceleration of a particle executing planar motion. Obtain an expression for areal velocity in plane polar co-ordinates.

19) State Kepler's laws of planetary motion. Prove the law of period of planets round the sun.

20) State parallel and perpendicular axes theorems. Obtain an expression for moment of inertia of a plane rectangular lamina about the axis passing through its centre and perpendicular to its plane.

21) Deduce the expression for co-efficient of viscosity of a liquid by Poiseuilli's capillary flow method.

22) State Maxwell's law of velocity distribution and law of equipartition of energy. Obtain an expression for mean free path of the gas molecules.

23) Derive Classius-Clapeyron latent heat equation. Explain the effect of pressure on the boiling point of water.

24) With neat diagram, describe Joule-Thomson porous plug experiment. Discuss the experimental results.

SECTION – D

IV. Answer **any TWO** questions : **(2×10=20)**

25) a) What are the advantages of multistage rockets ? Deduce an expression for the instantaneous velocity of a rocket taking into account the variation of its mass and neglecting the effect of gravity. **6**

b) A rocket of mass 400 kg has 360 kg of fuel. The exhaust velocity of the fuel is 2 km s^{-1}. calculate the final speed gained by the rocket when the rate of consumption of the fuel is 4 kg s^{-1}. **4**

26) a) Obtain an expression for the depression of the loaded end of a single cantilever. **6**

b) Find the energy stored in a wire 5 meters long and 10^{-3} metre in diameter when it is stretched through 3×10^{-3} metre by a load. Young's modulus of the wire is 2×10^{11} Nm^{-2}. **4**

27) a) What is an irreversible process ? Obtain the expression for the efficiency of a Carnot heat engine in terms of source and sink temperature. **6**

b) One mole of monoatomic perfect gas at 27°C is compressed so that its pressure is doubled. Calculate the resulting difference in degree celsius. **4**

28) a) State Wein's displacement law and Stefan's 4^{th} power law. Explain the essential features of the distribution of energy in the blackbody spectrum. **6**

b) A uniformly heated enclosure is maintained at a temperature of 1027°C and has a cavity of diameter 4 mm which acts like a black body. Calculate the energy radiated per hour from the cavity. $\sigma = 5.7 \times 10^{-8}$ w m^{-2} k^{-4}. **4**