



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

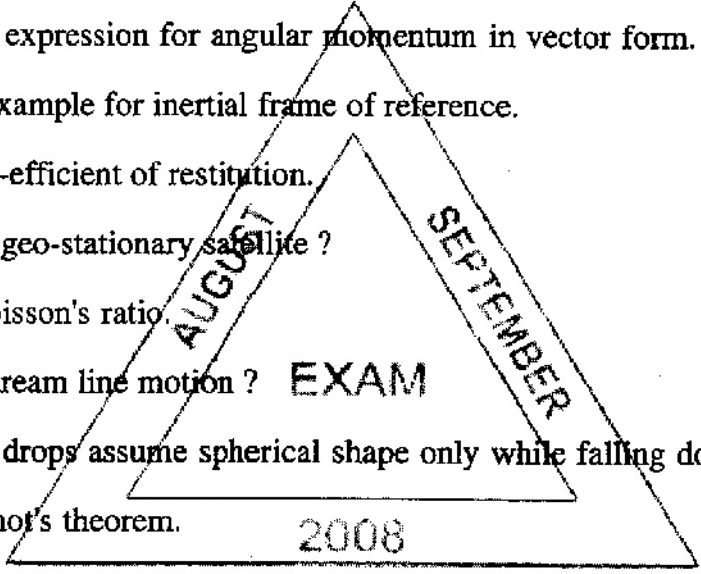
Max. Marks : 80

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 Carnot'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

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- 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 Poiseuille'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 Clausius-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 $2 \times 10^{11} \text{ Nm}^{-2}$. 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 4th 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. $\sigma = 5.7 \times 10^{-8} \text{ w m}^{-2} \text{ k}^{-4}$. 4