First Year B.Sc., Degree Examination

August / September 2009

Directorate of Correspondence Course

Physics (Freshers)

Paper - I

Mechanics, Properties of matter, Heat & Thermodynamics

Time : 3 Hours Max. Marks : 80

Instructions:

(1) Answer ALL questions in Section A.

(2) Answer any FIVE questions from Section B, any FIVE questions from Section C and any TWO questions from Section D

(3) Draw neat labelled diagrams

(4) Take the necessary data from the tables.

SECTION - A

I. Answer ALL the questions. **9x1=9 marks**

1. Define Areal velocity.
2. What is Pseudo force?
3. Write Newton's law of gravitation in vector form.
4. Define simple harmonic motion.
5. Mention the unit of surface tension.
6. State law of equipartition of energy.
7. State first law of thermodynamics.
8. What is a real gas?
9. Define Solar constant.

SECTION - B

II. Answer any FIVE questions. **5x3=15 marks**

10. Distinguish between inertial and non-inertial frames of reference with an example.
11. Define Angular momentum and torque, write the relation between them.
12. Mention the uses of artificial satellites.
13. State Kepler's laws of planetary motion.
14. Distinguish between streamline and turbulent motion.
15. Derive an expression for workdone during isothermal changes.

16. Determine surface temperature of the sun using the following data, mean distance of earth from the sun d = 1.5×10^{11}m, Radius of the sun R = 6.96×10^{8}m. Solar constant S = 1.35×10^{3}w/m^2, Stefan's constant $\sigma = 5.67 \times 10^{8}$ w/m^2/K^4.

SECTION - C

III. Answer any SIX questions. **6x6=36 marks**

17. Obtain an expression for pseudoforce in a non-inertial frame of reference.
18. Derive an expression for orbital velocity and period of revolation of a satellite.
19. What is a Compound Pendulum ? Derive an expression for the period of oscillation of a compound pendulum.
20. Derive Poiseulle's formula for the coefficient of viscosity of a liquid.
21. What is Cohesive Force ? Derive the relation between surface energy and surface tension.
22. Explain the concept of entropy. Describe the entropy changes in reversible and irreversible changes.
23. With a neat labelled diagram give the theory of porous - plug experiment.
24. Derive Plank's law of radiation from the concept of harmonic oscillators.

SECTION - D

IV. Answer any TWO questions. **2x10=20 marks**

25. a) Derive an expression for instantaneous and final velocities of a rocket without considering the effect of earth's gravity. **7 marks**

    b) Earth revolves round the sun in an orbit of mean radius 150 million kilometers with a period of 365 days. Calculate the mass of the sun given G = 6.67×10^{-11} SI units. **3 marks**

26. a) Obtain an expression for the depression at the loaded end of a Cantilever. **7 marks**

    b) Find the amount of workdone in twisting a steel wire of radius 1 mm and length 25 cm through an angle of 45°. Given rigidity modulus for steel = 8×10^{10} N/m^2. **3 marks**

27. a) Describe latent heat equation of Clausius and Clapeyron and discuss the effect of pressure on boiling point & melting point. **7 marks**

    b) Calculate the change in entropy when 10 gm of ice at 0°C is converted into water at the same temperature. (Given latant heat of w: r 80 cal/gm) **3 marks**

28. a) Explain the method of liquification of air by Linde's process and distinguish between ideal and real gas. **7 marks**

    b) Calculate the surface temperature of the sun if the wavelength of maximum intensity is 4753Å. Given Wein's constant = 2.93×10^{-3} meter/degree. **3 marks**

* * *