First Year B.Sc., Degree Examination

August/Semptember 2010

DIRECTORATE OF CORRESPONDENCE COURSE

PHYSICS *(Freshers)*

Paper - I: MECHANICS, PROPERTIES OF MATTER,

HEAT AND THERMODYNAMICS

Time: 3 hrs]   *[Max.Marks: 85*

Instruction:

1. *Answer all questions in Section – A.*
2. *Answer any **FIVE** questions from Section – B, any **SEVEN** questions from Section – C and any **TWO** questions from Section – D.*
3. *Draw neat labeled diagrams.*
4. *Take the necessary data from the tables.*

SECTION – A

I. Answer ALL the questions: 8 X 1 = 8 Marks

1. When the dot product of two non – zero vertors is zero?

2. Earth is not an inertial frame. Why?

3. Mention the type of collision in which some paste is thrown on a wall which strikes to it.

4. State the theorem of perpendicular axes.

5. Mention the physical significance of indicator diagram.

6. How many degrees of freedom does a oxygen molecule posses?

7. State Wein's displacement law.

8. What is temperature of inversion?

SECTION – B

II. Answer any FIVE questions: 5 X 3 = 15 Marks

9. Define the centre of mass. Show that the velocity of the centre of the mass of a system remains constant.

10. Discuss the effect of gravity on the motion of Rocket.

11. State and prove the kepler's third law from newton's law of Gravitation.

12. Define the term angle of contact incase of a liquid. Mention the factors on which it depends.

13. Distinguish between stream line & turbulent motion.

14. Derive an expression for work done in an adiabatic change.

15. A body loses energy at the rate of 40 watts from its surface when its temperature is $1227°$ C. calculate the temperature when it is losing energy at the rate of 2560 watts assuming the body to be perfectly black.

SECTION - C

III. Answer any SEVEN questions: 7 X 6 = 42 Marks

16. Give the theory of compound pendulum.

17. What is a conical pendulum? Obtain the expressions for period of conical pendulum in
    (i) Inertial frame   (ii) Non – inertial frame.

18. Define escape velocity of a body. Obtain an expression for it. Write down any three conditions of an earth satellite to be stationary.

19. Define moment of inertia of a body interms of its kinetic energy and hence obtain an expression for moment of inertia of a rectangular plate about an axis passing through its centre & ⊥r to its plane.

20. Distinguish between critical velocity and terminal velocity obtain an expression for stoke's law from dimensional analysis.

21. Derive an expression for surface tension of water in case of capillary rise.

22. What is T – S diagram? Explain. Derive an expression for change in entropy when ice changes into steam.

23. With a neat diagram, give the theory of porous – plug experiment.

24. Deduce Rayleigh – Jean's law and Stetan's law from Planek's law.

SECTION - D

IV. Answer any TWO questions: 2 X 10 = 20 Marks

25. **a)** Find the Radial and Transverse components of velocity and acceleration of a particle moving in a plane. **7 Marks**

   b) A particle moves from a point $(3, -4, -2)$m to a point $(-2, 3, 5)$ m under the influence of a force $\vec{F} = (-2\,\hat{i} + 2\,\hat{j} + 4\,\hat{k})$ Newtons. Calculate the workdone by the force. **3 Marks**