Q.P. Code – 50621

First Year B.Sc. Degree Examination

OCTOBER/NOVEMBER 2014

(Directorate of Distance Education)

Physics

(DSA 210) Paper I – MECHANICS, PROPERTIES OF MATTER, HEAT AND THERMODYNAMICS

Time : 3 Hours] *[Max. Marks : 75/85*

Instructions to Candidates :

1) *Students who have attended **25** marks **I-A** scheme will have to answer for total of **75** marks.*

2) *Students who have attended **15** marks **I-A** scheme will have to answer for total of **85** marks.*

3) *Section-**E** is **compulsory** for **85** marks scheme **only**.*

SECTION – A

I. Answer **ALL** questions : **10 × 1 = 10**

1. Define scalar triple product of 3 vectors.

2. What is a pseudo force?

3. What happens to loss in kinetic energy during an Inelastic collision?

4. State the theorem of parallel axes.

5. What is neutral surface?

6. After exceeding critical velocity, what happens to the motion of the fluid?

7. Write the expression for rms velocity for a gas molecule in terms of temperature and its mass?

8. Mention the unit for specific heat ratio γ.

9. Draw the T-S diagram for Carnot's cycle.

10. Write any one factor which affects solar radiation received at a place on the surface of the earth.

SECTION – B

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

11. Show that the derivative of a vector $\vec{A}$, of constant magnitude, is a vector $\perp$r to $\vec{A}$ itself.

12. With the necessary theory, explain the method of determining acceleration using a plumb line.

13. Write a note on Multistage rocket.

14. Mention the condition for a satellite to be geostationary.

15. Explain the process of regenerative cooling.

16. Explain the characteristics of Black body spectrum.

17. List the fundamental assumptions of Kinetic theory of gases.

SECTION – C

III. Answer any **FIVE** questions : **5 × 6 = 30**

18. What is Planar motion? Derive an expression for radial and transverse components of velocity and acceleration, in a planar motion.

19. What is an inertial frame? Show that an accelerated frame of reference is not an inertial frame of reference.

20. Mention the characteristics of central force motion. State and prove conservation of areal velocity and angular momentum.

21. Obtain an expression for moment of inertia of a solid cylinder about an axis passing through its centre and perpendicular to its length.

22. Derive an expression for excess of pressure within a curved surface and discuss the factors affecting the surface tension of a liquid.

23. Deduce Poiseuille's equation for the flow of a liquid through a horizontal capillary tube.

24. Derive Clausius clapeyron latent heat equation and discuss the change of freezing point and boiling point of water with respect to pressure.

SECTION – D

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

25. (a) Obtain an expression for instantaneous velocity of a rocket taking gravitation into account.

(b) A ball from a height 8 mt rebounds from a rigid floor and raises to a height of 6.4 mt. Calculate the coefficient of restitution and loss of kinetic energy during collision. **6 + 4**

26. (a) Give the theory of single cantilever loaded at the free end.

(b) Find the amount of work done in twisting a steel wire of radius 2 mm and length 50 cm through an angle of 45°. Given rigidity modulus for steel is 8×10^{11} Nm^{-2}. **6 + 4**

27. (a) Calculate the value for ratio of specific heat γ in case of monoatomic and diatomic gases.

(b) Derive Planck's radiation formula from the concept of harmonic oscillators. **4 + 6**

28. (a) Derive the relations between P, V and T during an adiabatic process for an ideal gas.

(b) Calculate the work done during an

(i) isothermal change and

(ii) adiabatic change. **6 + 4**

SECTION – E

V. Answer any **ONE** question : **1 × 10 = 10**

(**Compulsory** question for **85** marks scheme **only**)

29. State and deduce all three Kepler's laws of planetary motion from Newton's law of gravitation. **10**

30. (a) Describe with necessary diagram the porous plug experiment and its results. **4**

(b) Derive an expression for critical pressure, critical volume, critical temperature and temperature of inversion in terms of Vanderwaal's constants. **6**

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