

Q.P. Code – 50621

First Year B.Sc. Degree Examination, OCTOBER/NOVEMBER 2016

(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 a total of **75** marks.*
- 2) *Students who have attended **15** marks **I-A** Scheme will have to answer for a total of **85** marks.*
- 3) *Section **E** is **compulsory** for **85**-marks scheme only.*

SECTION – A

I. Answer ALL questions :

10 × 1 = 10

1. State Galilian principle of relativity.
2. Define areal velocity.
3. Distinguish between elastic and inelastic collisions.
4. Define coefficient of viscosity.
5. Define mean free path of a molecule.
6. What is an indicator diagram?
7. Distinguish between real gas and perfect gases.
8. Define solar constant.
9. Define efficiency of a heat engine.
10. What is a compound pendulum?

Q.P. Code – 50621

SECTION – B

II. Answer any FIVE Questions :

5 × 3 = 15

11. Distinguish between inertial and non inertial frames.
12. Derive the relation between torque and angular momentum.
13. Define escape velocity and obtain expression for the escape velocity of an artificial satellite.
14. Show that the Poisson's ratio value lies in between -1 and 0.5 .
15. State First Law of thermodynamics and Kelvin's and Clausius statements of second law of thermodynamics.
16. Calculate the change in entropy when 10 gm of ice at 0°C is converted into water at the same temperature. Given latent heat of ice 3.35×10^5 J kg⁻¹.
17. Find the value of ' γ ' for monoatomic gas.

SECTION – C

III. Answer any FIVE Questions :

5 × 6 = 30

18. Discuss the motion of a conical pendulum w.r.t. a laboratory frame and a frame attached to the rotating bob.
19. State and prove parallel axes and perpendicular axes theorems.
20. What is bending moment? Obtain the expression for bending moment of a beam.
21. Explain the term surface energy. Derive the relation between surface tension and surface energy.
22. Derive the relation between p , v and T during an adiabatic process.
23. What is radiation pressure? Explain how surface temperature of sun can be estimated using radiation laws.
24. Show that the energy of a loaded spiral spring executing SHM is conserved.

Q.P. Code – 50621

SECTION – D

IV. Answer any TWO Questions :

2 × 10 = 20

25. (a) Obtain expression for the instantaneous velocity and maximum velocity of a rocket during its flight neglecting the effect of gravity. **7**
- (b) An artificial satellite revolves in a circular orbit at a height 300 km above the earth's surface. Assuming the earth's radius to be 6.4×10^6 meter and 'g' at the earth's surface to be 9.8 ms^{-2} . Calculate the period of the satellite. **3**
26. (a) Derive Poiseuille's equation for the volume of liquid flowing through a capillary tube. **7**
- (b) A horizontal force of 100 Newton is required to move a metal plate of area 4 m^2 with a velocity 0.14 ms^{-1} , when it rests on a layer of a liquid of thickness $4 \times 10^{-3} \text{ m}$. Calculate the coefficient of viscosity of the oil. **3**
27. (a) Describe porous plug experiment and mention the results. **7**
- (b) Calculate the value of critical temperature for carbondioxide given that $a = 0.00874$ atmosphere and $b = 0.0023 \text{ cc}$. **3**
28. (a) Derive an expression for the efficiency of a Carnot's heat engine in terms of temperature of source and sink. **7**
- (b) Calculate the efficiency of a reversible heat engine working between the temperature 167°C and 57°C . **3**

SECTION – E

V. Answer any ONE of the following questions :

1 × 10 = 10

(Compulsory Question for 85 marks scheme only)

29. (a) Define scalar product of two vectors. Give two physical examples.
- (b) Derive Kepler's laws from Newton's law of gravitation. **2 + 8**
30. (a) Derive Clausius Clayperon's Latent heat equation. What is the effect of change of pressure on the boiling point and melting point of a substance?
- (b) The entropy of an irreversible process increases. Explain. **8 + 2**