

Time: 3 Hours 15 Minutes**Max. Marks : 70****PART A****I. Answer ALL of the following Questions****10 × 1 = 10**

1. Write the dimensional formula for linear momentum.
2. Define null vector
3. When does the work done by a force is zero?
4. Define radius of gyration.
5. Mention the escape speed of an earth satellite.
6. Among rubber and steel which one has more elasticity?
7. Define angle of contact.
8. Give principle of calorimetry.
9. What is the equation of state for adiabatic process?
10. Name a factor on which internal energy of the gas depends.

PART B**II. Answer any FIVE of the following questions.****5 × 2 = 10**

11. Name the strongest and weakest forces in nature.
12. Mention any two sources of systematic errors.
13. Distinguish between path length and displacement.
14. What is projectile? Give an example.
15. Write any two advantages of friction.
16. Write the relation between 'g' and 'G' and explain the terms.
17. Where is the velocity of the body maximum and minimum in case of SHM?
18. What are Longitudinal waves and Transverse waves?

PART C**III. Answer any FIVE of the following questions.****5 × 3 = 15**

19. State and explain law of triangle of vectors. When will be the resultant of two given vectors is maximum?
20. State Newton's first law of motion. Hence define force and inertia.
21. What is collision? Distinguish between elastic collision and inelastic collision.
22. Draw a typical stress –strain curve for a metal. Mention yield point and fracture point.
23. Derive an expression for pressure at a point inside a liquid.
24. Define a) specific heat of gas at constant volume b) specific heat of gas at constant pressure and c) latent heat of fusion.
25. Mention three postulates of Kinetic theory of gasses.
26. Discuss the modes of vibrations in closed pipe.

PART D**IV. Answer any TWO of the following questions****2 × 5 = 10**

27. What is uniform circular motion? Obtain an expression for centripetal acceleration.
28. State and prove the law of conservation of linear momentum in case of collision of two bodies.
29. State and explain parallel axes theorem and perpendicular axes theorem.

V. Answer any TWO of the following questions.**2 × 5 = 10**

30. Derive an expression for the variation of the acceleration due to gravity with depth.
31. Explain different stages of Carnot's cycle with P – V diagram.
32. Derive an expression for total energy of a particle executing simple harmonic motion and hence show graphically.

VI. Answer any THREE of the following questions.

3 × 5 = 15

33. A car moving along a straight highway with a speed of 126 km h^{-1} is brought to a stop within a distance of 200 m. What is the retardation of the car and how long does it take for the car to stop?
34. A pump on the ground floor of a building can pump up water to fill a tank of volume 40 m^3 in 20 minutes if the tank is 30 m above the ground and the efficiency of the pump is 60%. How much electric power is consumed by the pump? Given density of water = 1000 kg m^{-3} and acceleration due to gravity = 9.8 ms^{-2} .
35. A dental drill accelerates from rest to 900 rpm in 2s. What is the angular acceleration? How many revolutions does it make in coming to full speed?
36. Two rods of copper and brass having the same length and cross section are joined end to end. The free end of the copper rod is kept at 273K and free end of the brass rod is kept at 373K. Calculate the temperature of the junction of the two rods at steady state. Assume that thermal conductivity of copper is 4 times that of brass.
37. A train standing at the outer signal of a railway station blows a whistle of frequency 400 Hz in still air,
 - a. What is the frequency of whistle for a platform observer when the train
 - i. Approaches the platform with speed of 10 ms^{-1} .
 - ii. Recedes from the platform with speed of 10 ms^{-1} .
 - b. What is the speed of sound in each case? (speed of sound in air 340 ms^{-1}).
