

General Instructions:

1. All the parts are compulsory.
2. Answers without relevant diagram/figure/circuit wherever necessary will not carry any marks.
3. Direct answers to the numerical problems without detailed solutions will not carry any marks.

Part - A**I Answer the following questions****10x1=10**

1. Write the number of significant figures in 2.345.
2. When the magnitude of the resultant of the two vectors is maximum?
3. What does the area under the force-displacement curve represents?
4. Define the term radius of gyration.
5. What is the period of revolution of geostationary satellites?
6. State Hooke's law
7. Why drops and bubbles are spherical in shape?
8. What is the significance of first law of thermodynamics?
9. How the kinetic energy of gas depends on its temperature?
10. What are beats?

Part - B**II Answer any five of the following questions****5x2=10**

11. Mention any two basic forces in nature.
12. Write fundamental physical quantities in SI system.
13. State and explain the law of parallelogram of vector addition.
14. Define static friction and kinetic friction.
15. Write the relation between acceleration due to gravity and universal gravitational constant and explain the terms.
16. Distinguish between Streamline and turbulent flow of liquid.
17. A particle takes 40s to make 20 oscillations. Calculate the time period and frequency of oscillation.
18. At which position, the displacement of a particle in stationary wave is (i) maximum and (ii) minimum.

Part - C**III Answer any Five of the following questions****5x3=15**

19. Define relative velocity. Draw position time graph of two objects moving along a straight line when their relative velocity is (i) Zero and (ii) non zero
20. Derive the expression for centripetal acceleration.
21. Derive $\vec{F} = m\vec{a}$, where the symbols have their usual meanings.
22. What are elastic and inelastic collision? Give an example for elastic collision.
23. Draw stress - strain graph for metal. Mention yield point and fracture point.
24. Explain molar specific heat of a gas at constant (i) pressure and (ii) volume. Write the relation between them in terms of gas constant.

(P.T.O.)

25. Define degrees of freedom. Write the number of degrees of freedom for (i) monoatomic gas and (ii) diatomic gas.
26. Why Newton's formula for speed of sound in gas fails? What is Laplace's correction? Write Newton-Laplace formula for speed of sound in gas.

Part - D

IV Answer any Two of the following questions

2x5=10

27. What is v-t graph? Derive the expression $x = V_0 t + \frac{1}{2} a t^2$ using v-t graph.
28. State the principle of conservation of mechanical energy and illustrate in the case of freely falling body.
29. Write any five comparison between linear and rotational motion.

V Answer any Two of the following questions

2x5=10

30. What is gravitational potential energy? Derive the expression for gravitation potential energy.
31. Explain any two types of expansions of solids with relevant equations. Write the SI unit of Co-efficient of expansion of solid.
32. Derive the expression for total energy of a particle executing simple harmonic motion (SHM).

VI Answer any Three of the following questions

3x5=15

33. The ceiling of a long hall is 20m high. What is the maximum horizontal distance that a ball thrown with a speed of 40ms⁻¹ can go without hitting the ceiling of the hall? (g=10ms⁻²)
34. A driver of a car moving at 20ms⁻¹ finds a child on the road 50m ahead and stops the car 10m earlier to the child. If the mass of the car with the driver is 1000kg. Calculate the force exerted by the breaks on the car and the time taken to stop the car.
35. A fly wheel of mass 10kg and diameter 0.4m rotating at 120rpm has its speed increased to 720rpm in 8 seconds. Find the torque acting on fly wheel.
36. The efficiency of carnot heat engine is 25%. When the temperature of the source alone is raised by 100K, the efficiency becomes 50%. Find the temperature of the source and sink.
37. A train at rest blows a whistle of frequency 600Hz in still air, what is the frequency of whistle for a platform observer when the train. (a) approaches the platform with a speed of 15ms⁻¹ (b) recedes from the platform with a speed of 15ms⁻¹? What is the speed of sound in each case? Speed of sound in air is 345ms⁻¹.