



PART-A

I Answer ALL the following questions:

10 x 1 = 10

- 1 Give the basis of cesium atomic clock.
- 2 When is the relative velocity of two bodies equal to zero?
- 3 Which component of velocity of a projectile remains constant.
- 4 Where does the centre of mass of a rectangular lamina lie?
- 5 What is weightlessness?
- 6 State Hooke's law.
- 7 At what temperature density of water is maximum?
- 8 What is meant by mean free path of a gas?
- 9 Define phase of a wave.
- 10 Give an example for periodic motion.

PART-B

II Answer any FIVE of the following questions:

5 x 2 = 10

- 11 Mention any two fundamental forces in nature.
- 12 Draw v-t graph for a body moving with a) uniform velocity b) uniform positive acceleration.
- 13 Write an expression for horizontal range of a projectile. What is the angle of incidence for which the horizontal range is maximum?
- 14 Write the conditions for equilibrium of a rigid body.
- 15 What are geostationary satellites?
- 16 Define Young's modulus of elasticity. Write the SI unit.
- 17 State second laws of thermodynamics.
- 18 Human heart beats 80 times in 1 minute. What is the frequency of heart beat?

PART-C

III Answer any FIVE of the following questions:

5 x 3 = 15

- 19 Check the correctness of the equation $E = \frac{1}{2}mv^2$.
- 20 Derive an expression for maximum speed of a car on a level road.
- 21 Write an expression for vector product of two vectors. When is it a) maximum b) minimum.
- 22 Derive work-energy theorem for a constant force.
- 23 Obtain an expression for work-done in an isothermal process.
- 24 Mention any three properties of thermal radiation.
- 25 Deduce a relation between kinetic energy and temperature of a gas molecule.
- 26 Distinguish between longitudinal and transverse waves.

PART-D

IV Answer any TWO of the following questions:

2 x 5 = 10

- 27 What is uniform circular motion? Derive an expression for centripetal acceleration.
- 28 Verify the law of conservation of mechanical energy in case of freely falling body.
- 29 Define a) torque b) angular momentum of a body. Obtain a relation between them.

V Answer any TWO of the following questions:

2 x 5 = 10

- 30 State and explain Bernoulli's principle.
- 31 State laws of thermal conductivity. Hence define the coefficient of thermal conductivity.
- 32 Derive an expression for the time period of a simple pendulum.

VI Answer any THREE of the following questions:

3 x 5 = 15

- 33 A bomb is dropped from an aeroplane in level flight at a speed of 40m/s from a height of 490m above the ground. How far ahead of the point of dropping does the bomb hit the ground.
- 34 A railway engine of mass 5000kg travels along a level track at 75 kmph and collides with a wagon of mass 15000 kg travelling in the opposite direction with a velocity of 20kmph. After impact the engine

- is found to travel in the same direction as before with the speed of 3kmph. Find the speed of the wagon.
- 35 Calculate the value of acceleration due to gravity at (a) the bottom of mine 8 km deep and (b) an altitude 32 km above the earth's surface. Radius of the earth is 6.4×10^6 m and g on the surface of the earth is 9.8 ms^{-2} .
- 36 A Carnot's engine has an efficiency of 0.3 when the temperature of the sink is 350k. Find the change in temperature of the source when the efficiency becomes 0.5.
- 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 the speed of 15ms^{-1} . (b) recedes from the platform with the speed of 15ms^{-1} . What is the speed of sound in each case? Speed of sound in air is 345ms^{-1} .
