CHAPTER 3

Motion in a Straight line

I. <u>One mark questions (PART – A):</u>

- 1. When does an object said to be in motion? (K)
- 2. What is rectilinear motion? (K)
- 3. What is meant by path length? (K)
- 4. Define displacement? (K)
- 5. What is the position time graph? (K)
- 6. Define uniform velocity. (K)
- 7. Define speed of a body. (K)
- 8. Define Velocity of a body. (K)
- 9. Define instantaneous velocity of a body in terms of its average velocity.
- 10. The average velocity of a body is equal to its instantaneous velocity. What do you conclude by this? (U)
- 11. What does the slope of position time graph represent? (K)
- 12. What is meant by uniform motion? (K)
- 13. Define average acceleration. (K)
- 14. Define instantaneous acceleration of a body in terms of its average acceleration. (U)
- 15. What does the slope of velocity time graph represent? (K)
- 16. What does area under velocity time graph represent? (K)
- 17. When does relative velocity of two moving objects zero? (U)
- 18. What is the acceleration of a body moving with constant velocity? (U)
- 19. If a car is traveling towards east can its acceleration be west ward? (U)
- 20. When does an object said to be at rest? (K)
- 21. A body moving along a circular path with uniform speed. Does it has acceleration.(K)
- 22. What is position time graph? (K)
- 23. What is velocity time graph? (K)
- 24. What is acceleration time graph? (K)
- 25. Draw the v-t graph of a body thrown vertically upwards. (U)
- 26. Draw the x-t graph of a body thrown vertically upwards. (U)
- 27. Draw the v-t graph of a body starting from rest & moving with uniform velocity. (K)
- 28. What does speedometer of a car measures? (A)
- 29. Two trains are moving in opposite directions with speeds 20 ms⁻¹& 10 ms⁻¹. The relative velocity of the trains is ans (30 ms^{-1) S}What is stopping distance? (A)
- 30. What is reaction time in motion? (K)
- 31. When will the relative velocity of two moving bodies zero? (U)
- 32. A car starting from rest has an acceleration of 5 ms⁻². How fast will it be after 10s. $(50 \text{ ms}^{-1})\text{S}$
- 33. A body is thrown vertically upward from the surface of the earth . What is the direction of acceleration of the body? (U

34. What is free fall? (K)

<u>Two mark questions (PART – B):</u>

- 1. Distinguish between distance and displacement. (K)
- 2. Distinguish between speed and velocity. (K)
- 3. Draw the position time graph for an object (i) at rest (ii) with uniform motion. (U)
- 4. Draw the position time graph for an object (a) moving with positive velocity and(b) Negative velocity(U)
- 5. Draw position time graph for motion with (a) positive acceleration (b) negativeacceleration (c) zero acceleration. (U)
- 6. Draw velocity time graphs for motion in (a) positive direction with positive acceleration (b) negative direction with negative acceleration. (U)
- 7. Find The displacement (in m) of a particle moving along x axis given by $x = 20t 10t^2$. Calculate the instantaneous velocity at t = 2s. (S) (60 ms⁻¹
- 8. A ball is thrown vertically upward and it reaches a height of 90 m. Find the velocity with which it was thrown. Ans 42 m/s (S)
- 9. Define relative velocity with an example. (K)
- 10. A car travels with a uniform velocity of 20 m⁻¹. The driver applies the brakes and the
- car comes to rest in 10 second. Calculate the retardation. (S) $(a = -2 \text{ ms}^{-2})$
- 11. A ball is thrown vertically upwards, At highest point of its path what will be its instantaneous velocity & acceleration. (U)
- 12. Two ball different masses (one lighter & other heavier) are thrown vertically with the same speed u from the top a of a tower. Which one will pass through the point of projection in the downward direction with the greater speed? (U)
- 13. Can the displacement may be positive negative or zero? Explain. (U)
- 14. Distinguish between speed and velocity. (K)
- 15. A body moves along a circular path of radius 2m.What are displacement & distance traveled by the body for one complete revolution? (S)

<u>Three mark questions (PART – C):</u>

- a) What is the velocity time graph? (K)
 b) Show that area underscale site, time graph is a such to disal
 - b) Show that area under velocity time graph is equal to displacement. (K)
- a) Define relative velocity of an object w.r.t another. (K)
 b) Draw position time graphs of two objects moving along a straight line when their relative velocity is (i) zero and (ii) non zero (K)
- 3. What is the significance of velocity time graph? (K)
- 4. What is the significance of displacement time graph? (K)
- 5. Derive the equation of motion $v = v_0 + at(K)$
- 6. A car is moving along a straight line AB= 360m. It move s from A to B in 18 S & returns from B to A in 6 s. Find the average velocity & average speed. (S)

Five mark questions (PART – D):

- 1. Derive the equation of motion $v^2 = v_0^2 + 2ax$ using v-t graph. (K)
- 2. Derive the equation of motion $x = v_0 t + \frac{1}{2} a t^2$ using v-t graph. (K)

 A car moving along a straight highway with speed of 126 km / hr brought to 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? (S)

(t = 11.66s)

 A balloon is ascending with a velocity of 9.8 ms⁻¹, a sand bag is dropped from the balloon when it is at a height of 39.2m from the ground. Calculate the time taken by bag to reach the ground. (S)

(t = 4 s.)

 A car starts from rest and accelerates uniformly at a rate of 2 ms⁻¹ for 20 second. It then maintains a constant velocity for 10 second. The brakes are then applied and the car is uniformly retarded and comes to rest in 5 second. Find the distance travelled. (S)

Ans 900m

- A stone is dropped from the top of a tower 400 m high and at the same time another stone is projected upward vertically from the ground with a velocity of 100 ms⁻¹?. Find where and when the two stones will meet. (a = 10 ms⁻²). (S) Ans:x = 320m
- 5. Two trains are moving in opposite directions. Train A moves east with a speed of 20 ms⁻¹ and train B moves west with a speed of 30 ms⁻¹. What is the (i) relative velocity of B w.r.t A and (ii) the relative velocity of ground w.r.t B. (iii) A monkey is running on the roof of train A against its motion with a velocity of 10 ms⁻¹ w.r.t train A. What is the velocity of the monkey as observed by a man standing on the ground? (S)
- 6. Two trains A and B of length 300 m each are moving on two parallel tracks with a uniform speed of 15 ms⁻¹ in the same direction, with the train A ahead of B. The driver of train B decides to overtake train A and accelerates by 2 ms⁻². If after 25s, the guard of train B brushes past the driver of train A, what was the original distance between the two trains? (S)
 - (x = 25m)
- 7. A body is thrown vertically up from the top of a building with a velocity of 10 ms⁻¹ It reaches the ground in 5 s. Find the height of the building and the velocity with which the body reaches the ground. (g = 10 ms⁻²).(S) (h = 75 m).
- 8. A ball is thrown with a velocity 30 ms⁻¹ from the ground . How high it will rise. Calculate the time taken to reach the ground. (g = 10 ms⁻²). (S) (Total time = 6 s)