

# Kinematics(A-1)

Total No. of Questions: 20

Total Marks: 80

## SECTION 1: MCQ

- Q1 Speed is a scalar quantity with dimensions (4 Marks)
- A.  $\frac{\text{distance}}{\text{time}}$
- B.  $\frac{\text{time}}{\text{time}}$
- C.  $\frac{\text{distance}}{\text{length}}$
- D.  $\frac{\text{time}^2}{\text{time}^2}$
- Q2 If a ball is thrown vertically upwards with 40 m/s its velocity after two second will be:- (4 Marks)
- A. 10 m/s
- B. 20 m/s
- C. 30 m/s
- D. 40 m/s
- Q3 An object is projected at an angle  $\alpha$  with the level ground. At an instant time  $t$ , the angle made by its position vector (from the point of projection) is  $\beta$ . Initial velocity of the projectile is: (4 Marks)
- A.  $\frac{gt \cos(\beta)}{2 \sin(\alpha - \beta)}$
- B.  $\frac{gt \sin(\alpha - \beta)}{2 \cot(\beta)}$
- C.  $\frac{gt \cos(\beta)}{2 \sin(\alpha + \beta)}$
- D.  $u = \frac{gt \cos \beta}{\sin(\alpha - \beta)}$
- Q4 A stone dropped from the roof of a building takes 4 s to reach the ground. The height of the building is. (4 Marks)
- A. 9.8m
- B. 19.6m
- C. 39.2m
- D. 78.4m
- Q5 In a ballistic demonstration, a police officer fires a bullet of mass 50 g with speed of  $200 \text{ m s}^{-1}$  on soft plywood of thickness 2 cm. The bullet emerges with only 10 % of its initial kinetic energy. What is the emergent speed of the bullet? (4 Marks)
- A. 30 m/s
- B.  $30\sqrt{2}$  m/s
- C.  $63.24 \text{ m/s}$
- D.  $30\sqrt{10}$  m/s

- Q6 The maximum range of a gun on horizontal surface is  $16\text{km}$ . If  $g = 10 \text{ ms}^{-2}$ , the muzzle velocity of the shell must be : (4 Marks)
- $1600 \text{ ms}^{-1}$
  - $400 \text{ ms}^{-1}$
  - $200\sqrt{2} \text{ ms}^{-1}$
  - $160\sqrt{10} \text{ ms}^{-1}$
- Q7 A car travelling at  $2 \text{ ms}^{-1}$  undergoes an acceleration of  $1 \text{ ms}^{-2}$ . How long will it take to double its velocity? (4 Marks)
- $1\text{s}$
  - $2\text{s}$
  - $3\text{s}$
  - $4\text{s}$
- Q8 A taxi leaves the station  $X$  for station  $Y$  every 10 minutes. Simultaneously, a taxi leaves the station  $Y$  also for station  $X$  every 10 minutes. The taxis move at the same constant speed and go from  $X$  to  $Y$  or vice-versa in 2 hours. How many taxis coming from the other side will each taxi meet en route from  $Y$  to  $X$ ? (4 Marks)
- 10
  - 12
  - 11
  - 23
- Q9 Which of the following quantities remain constant during projectile motion? (4 Marks)
- Average velocity between two points
  - Average speed between two points
  - $\frac{d\vec{v}}{dt}$
  - $\frac{dy}{dt}$  where  $y$  is vertical displacement.
- Q10 A particle is moving in a straight line with constant acceleration ' $a$ ' and initial velocity  $v_0$ . Average velocity during first  $t$  second is \_\_\_\_\_ (4 Marks)
- $v_0 + \frac{1}{2}at$
  - $v_0 + at$
  - $\frac{v_0 + at}{2}$
  - $\frac{v_0}{2}$
- Q11 Joseph jogs from one end A to the other end B of the straight 300 m road in 2 minutes 50 seconds and then turns around and jogs 100 m back to point C in another 1 minutes. Joseph's average speeds and velocities in jogging, between points A and B, respectively, will be (4 Marks)
- $1.76 \text{ ms}^{-1}$ ,  $1.76 \text{ ms}^{-1}$
  - $0.869 \text{ ms}^{-1}$ ,  $0.869 \text{ ms}^{-1}$
  - $1.76 \text{ ms}^{-1}$ ,  $0.869 \text{ ms}^{-1}$
  - $0.869 \text{ ms}^{-1}$ ,  $1.76 \text{ ms}^{-1}$

- Q12 The motor of an electric train can give it an acceleration of  $1 \text{ ms}^{-2}$  and brakes can give a negative acceleration of  $3 \text{ ms}^{-2}$ . The shortest time in which the train can make a trip between the two stations 1215 m apart is (4 Marks)
- A. 113.6s  
B. 56.9s  
C. 60s  
D. 55s
- Q13 Ben Rushin is waiting at a stoplight. When it finally turns green, Ben accelerated from rest at a rate of a  $6.00 \text{ m/s}^2$  for a time of 4.10 seconds. Determine the displacement of Ben's car during this time period. (4 Marks)
- A. 50.4m  
B. 50m  
C. 40.4m  
D. 80.4m
- Q14 A person drops a stone from a building of height 20m. At the same instant the front end of a truck passes below the building moving with constant acceleration of  $1 \text{ m/s}^2$  and velocity of  $2 \text{ m/s}$  at the instant. Length of the truck if the stone just misses to hits its rear part is:- (4 Marks)
- A. 6 m  
B. 4 m  
C. 5 m  
D. 2 m
- Q15 A 7 kg object is subjected two forces (in Newton)  $\vec{F}_1 = 20\hat{i} + 30\hat{j}$  and  $\vec{F}_2 = 8\hat{i} - 5\hat{j}$ . The magnitude of resulting acceleration in  $\text{ms}^{-2}$  will be. (4 Marks)
- A. 5  
B. 4  
C. 3  
D. 2
- Q16 The acceleration - time graph of a particle, which starts from rest and moves in a straight line, is given as shown in figure. The distance covered by particle in first 4 s is (4 Marks)
- A. 4 m  
B.  $\frac{16}{5} \text{ m}$   
C. 8 m  
D.  $\frac{16}{3} \text{ m}$
- Q17 An elevator is going up with an upward acceleration of  $1 \text{ m/s}^2$ . At the instant when its velocity is  $2 \text{ m/s}$ , a stone is projected upward from its floor with a speed of  $2 \text{ m/s}$  relative to the elevator, at an elevation of  $30^\circ$ . If the elevator was moving with a downward acceleration equal to  $g$ , how would the motion be altered? (4 Marks)
- A. A straight line with respect to elevator and projectile with respect to ground  
B. Projectile with respect to elevator and straight line with respect to ground  
C. Projectile wrt both elevator and ground  
D. Straight wrt both elevator and ground

- Q18 Two objects of mass ratio 1 : 4 are dropped from the same height. The ratio between their velocities when they strike the ground is: (4 Marks)
- Both objects will have the same velocity.
  - The velocity of the first object is twice that of the second one.
  - The velocity of the 2<sup>nd</sup> object is one fourth of that of the 1<sup>st</sup> object.
  - The velocity of the 2<sup>nd</sup> object is 4 times of that of the 1<sup>st</sup> one.
- Q19 Two swimmers  $A$  and  $B$  start swimming from exactly opposite points on the separate banks of a river of width  $8\text{ km}$ , flowing with a speed of  $3\text{ km/h}$ . If speed of both the swimmers w.r.t to ground is  $5\text{ km/hr}$  then what is the distance travelled by ' $A$ ' till they meet? (Assume that their velocities w.r.t. to river are perpendicular to river flow). (4 Marks)
- $4\text{ km}$
  - $6\text{ km}$
  - $20\text{ km}$
  - $5\text{ km}$
- Q20 A body is thrown up in a lift with a velocity  $u$  relative to the lift and the time of flight found to be  $t$ . The acceleration with which the lift is moving up is (Given acceleration due to gravity =  $g$ ) (4 Marks)
- $\frac{u - gt}{t}$
  - $\frac{2u - gt}{t}$
  - $\frac{u + gt}{t}$
  - $\frac{2u + gt}{t}$