

[SINGLE CORRECT CHOICE TYPE]

Q.1 A body starts from rest with uniform acceleration. Its velocity after  $2n$  second in  $v_0$ . The displacement of the body in last  $n$  seconds is [3]

- (A)  $\frac{v_0(2n-3)}{6}$  (B)  $\frac{v_0}{4n}(2n-1)$  (C)  $\frac{3v_0n}{4}$  (D)  $\frac{3v_0n}{2}$

Q.2 A boy throws an object horizontally with a velocity of  $6$  m/sec through the window of a bus moving with a velocity of  $36$  km/h. If the height of the window from the ground is  $3$  m and the object is thrown normal to the motion of the bus what is the velocity of impact on the ground [3]

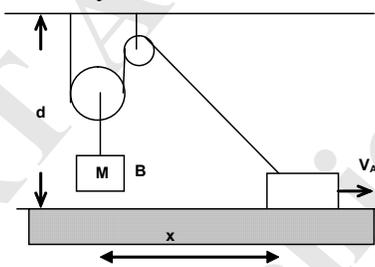
- (A)  $4\sqrt{6}$  m/sec. (B)  $4/\sqrt{10}$  m/sec. (C)  $4\sqrt{2}$  m/sec (D)  $14$  m/sec.

Q.3 A body projected with a certain velocity has horizontal range three times the maximum height. Find the change in the angle of projection required to make the horizontal range four times the maximum height (A)  $-8^\circ$  (B)  $8^\circ$  (C)  $16^\circ$  (D)  $-16^\circ$  [3]

Q.4 A particle projected from the foot of an inclined plane of angle  $\beta$  strikes the plane elastically at a point and rises vertically upwards. If the angle of projection is  $\alpha$  find its angle of incidence on the plane. [3]

- (A)  $\beta$  (B)  $\alpha - \beta$  (C)  $\alpha + \beta$  (D)  $\frac{\pi}{2} - \beta$

Q.5 A tractor A is used to hoist the body B with pull by arrangement shown in fig. If A has a forward velocity  $V_A$ , find the velocity of the body B [3]



- (A)  $\frac{x V_A}{2}$  (B)  $\frac{x V_A}{d}$  (C)  $\frac{x V_A}{2\sqrt{x^2 + d^2}}$  (D) none of these

Q.6 The position of a particle along x-axis is given by  $x = 1 + t - t^2$ . The distance travelled in  $2$  s is [3]

- (A)  $1$  m (B)  $2$  m (C)  $2.5$  m (D)  $3$  m

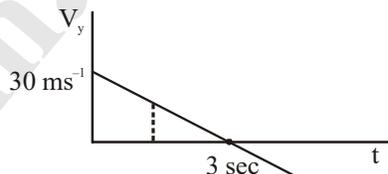
Q.7 A balloon is ascending at the rate of  $14 \text{ ms}^{-1}$  at a height of  $98$  m above ground where a packet is dropped, time after which the packet reach the ground is [3]

- (A)  $6$  s (B)  $3$  s (C)  $9$  s (D)  $4.9$  s

Q.8 A man wants to reach a point on the other bank of a river that is directly opposite to his starting point. River flows at the rate of  $4$  km/hr. and swimming speed of the man relative to water is  $3$  km/hr. Then

- (A) To reach the desired point he should start swimming at an angle of  $\cos^{-1}(3/4)$  with stream [3]  
 (B) To reach the desired point he should start swimming at an angle of  $\cos^{-1}(-3/4)$  with stream  
 (C) To reach the desired point he should start swimming at an angle of  $\cos^{-1}(4/3)$  with stream  
 (D) He can not reach the desired point directly by swimming.

- Q.9 A particle is projected vertically upwards with a velocity of 20 m/sec. Find the time at which the distance travelled is twice the magnitude of displacement [3]  
 (A)  $2 + \sqrt{4/3}$  sec (B) 1 sec. (C)  $2 + \sqrt{3/4}$  (D) 3 sec
- Q.10 Two men who can swim with a speed  $v_1$  in still water start from the middle of a river of width  $d$  and move in opposite directions always swimming at an angle  $\theta$  with the banks. What is the distance between them along the river when they reach the opposite banks, if the velocity of the river is  $v_2$  [3]  
 (A)  $\frac{dv_1}{dv_2} \cot \theta$  (B)  $\frac{dv_1 \cos \theta}{v_1 + v_2}$  (C)  $\frac{dv_2}{v_1} \tan \theta$  (D)  $d \cot \theta$
- Q.11 A particle of mass  $m$  moves horizontally with initial velocity  $u$ , in a medium where the magnitude of resistance force is  $k mV$  (where  $k$  is a positive constant) and  $v$  is the velocity at time  $t$ , what is the maximum distance of the particle from the starting point? [3]  
 (A)  $9/k$  (B)  $34/k$  (C)  $24/k$  (D) none of these
- Q.12 Two particles are simultaneously projected in opposite directions horizontally from a given point in space where gravity 'g' is uniform. If  $u_1$  and  $u_2$  were their initial speeds then the time after which their velocities are mutually perpendicular is given by [3]  
 (A)  $\frac{\sqrt{u_1^2 + u_2^2}}{g}$  (B)  $\frac{\sqrt{u_1(u_1 + u_2)}}{g}$  (C)  $\frac{\sqrt{u_1 u_2}}{g}$  (D)  $\frac{\sqrt{u_2(u_1 + u_2)}}{g}$
- Q.13 A bird flies for 4 s with a velocity of  $|t - 2|$  m/s in a straight line, where  $t =$  time in seconds. It covers a distance of [3]  
 (A) 2 m (B) 4 m (C) 6 m (D) 8 m
- Q.14 A particle is falling freely under the gravity over a short distance from P to Q. M is the mid point of PQ. Then [3]  
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- Q.15 Between the two station a train accelerates uniformly at first, then moves with constant velocity and finally retards uniformly. If the ratio of the time taken be 1:8:1 and the max. speed attained be 60 km/h then what is the average speed over the whole journey? [3]  
 (A) 48 km/h (B) 50 km/h (C) 54 km/h (D) 56 km/h
- Q.16 Figure shows  $V_y - t$  graph of a particle projected from the ground. Then its height at  $t = 2$  sec will be [3]



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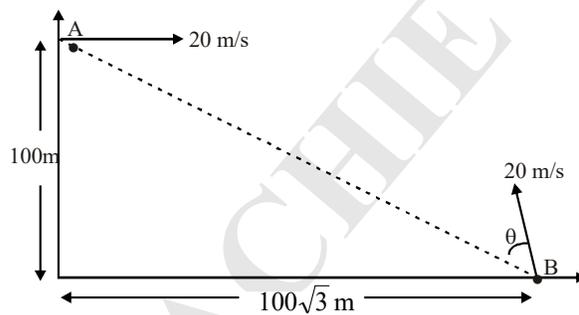
- Q.17 A boat is traveling due east at 12 m/s. A flag on the boat flaps at  $53^\circ$  N of W. Another flag on the shore flaps due north. [4]

- (A) Speed of wind with respect to ground is 16 m/s
- (B) Speed of wind with respect to ground is 20 m/s
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Q.18 A particle is moving along X-axis whose position is given by  $x = 4 - 9t + \frac{t^3}{3}$ . Mark the correct statement(s) in relation to its motion : [4]

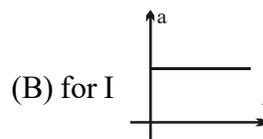
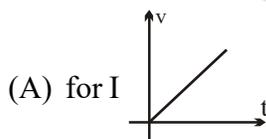
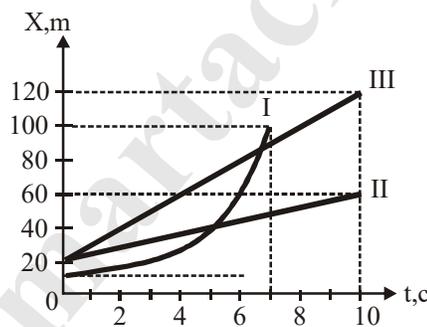
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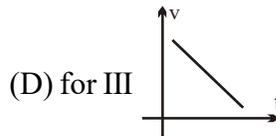
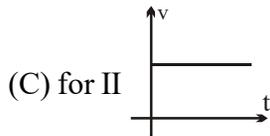
Q.19 Two small balls A and B are launched in the same vertical plane simultaneously, with same speed of 20 m/s at  $t = 0$ . Ball A has an initial horizontal velocity and ball B has initial velocity at an angle  $\theta$  above the line joining A and B as shown. If the projectiles collide in mid-air at time  $t$  : [4]



- (A)  $\theta = 30^\circ$
- (B)  $\theta = 60^\circ$
- (C)  $t = \frac{20}{\sqrt{3}} s$
- (D)  $t = \frac{10}{\sqrt{3}} s$

Q.20 Figure shows the position of the body moving in a straight line as a function of time for three different cases: I, II, III. Choose the correct(s) options. Curve I is a parabola [4]



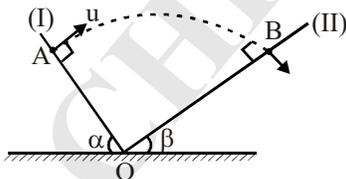


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Which of the following statements will be true about their motion ?

- (A) The horizontal range of the parabolic path is 3 m.
- (B) The maximum height for the parabolic path is 45 m.
- (C) The total time of flight in the parabolic path for each particle = 4s
- (D) The horizontal range of the parabolic path is 6 m.

- Q.22 Two inclined planes (I) and (II) have inclination  $\alpha$  and  $\beta$  respectively with horizontal, (where,  $\alpha + \beta = 90^\circ$ ) intersect each other at point O as shown in figure. A particle is projected from point A with velocity  $u$  along a direction perpendicular to plane (I). If the particle strikes (II) perpendicularly at B, then : [4]

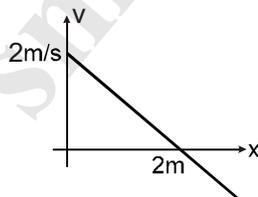


- (A) time of flight =  $u/g \sin \beta$
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- Q.23 A man is standing on a road and observes that rain is falling at angle  $45^\circ$  with the vertical. The man starts running on the road with constant acceleration  $0.5 \text{ m/s}^2$ . After a certain time from the start of the motion, it appears to him that rain is still falling at angle  $45^\circ$  with the vertical, with speed  $2\sqrt{2} \text{ m/s}$ . Motion of the man is in the same vertical plane in which the rain is falling. Then which of the following statement(s) are true : [4]

- (A) It is not possible
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- (A) magnitude of acceleration of particle may decrease when it moves in +x-direction.
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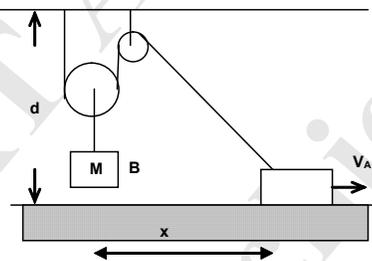
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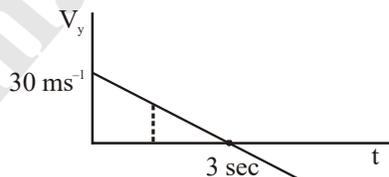
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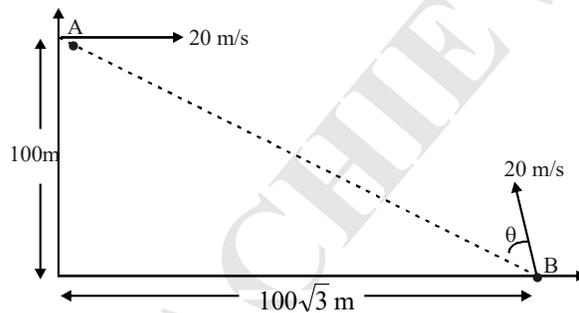
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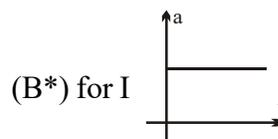
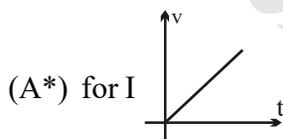
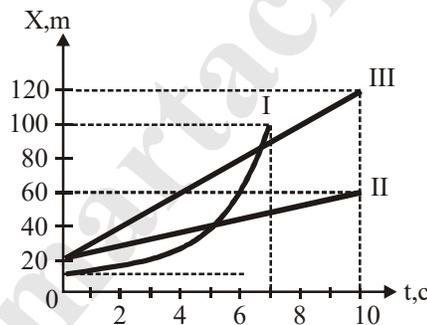
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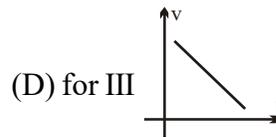
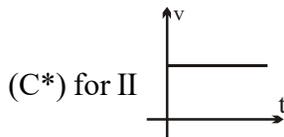
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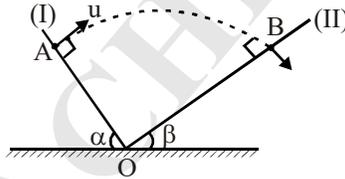


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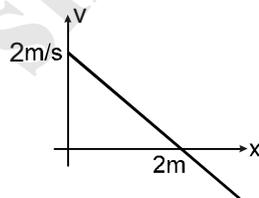


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