IIT FOUNDATION

WEEK TEST – 9

PHYSICS

SINGLE CORRECT CHOICE: **TOTAL MARKS: 24**

1. Two projectiles thrown from the same point at angles 60° and 30° with the horizontal attain the same height. The ratio of their initial velocities is

   1) 1 2) 2 3) $\sqrt{3}$ 4) $\frac{1}{\sqrt{3}}$

2. A projectile is thrown at angle β with vertical. It reaches a maximum height H. The time taken to reach the highest point of its path is

   1) $\sqrt{\frac{H}{g}}$ 2) $\sqrt{\frac{2H}{g}}$ 3) $\sqrt{\frac{H}{2g}}$ 4) $\sqrt{\frac{2H}{g\cos\beta}}$

3. A projectile shot into air at some angle with the horizontal has a range of 200m. If the time of flight is 5s, then the horizontal component of the velocity of the projectile at the highest point of trajectory is

   1) 40 ms^{-1} 2) 0ms^{-1} 3) 9.8ms^{-1} 4) 20 ms^{-1}

4. Two stones thrown at different angles have same initial velocity and same range. If H is the maximum height attained by one stone thrown at an angle of 30, then the maximum height attained by the other stone is

   1) H/2 2) H 3) 2H 4) 3H

5. A grass hopper finds that the he can jump a maximum horizontal distance of 1m. With what speed can he travel along the path if he spends a negligible time on the ground?[g=9.8m/s^2]

   1) 9.8 m/s 2) 4.42 m/s 3) 2.21m/s 4) 3.16m/s

6. A body is thrown with a velocity of 9.8ms^{-1} making an angle of 30° with the horizontal. It will hit the ground after a time [g=9.8m/s^2]

   1) 3.0s 2) 2.0s 3) 1.5s 4) 1s

7. If the initial velocity of a projectile be double, keeping the angle of projection same, the maximum height reached by it will

   1) be halved 2) be quadrupled 3) be doubled 4) remain the same

8. Two bodies are projected at angles θ and (90-θ) to the horizontal with the same speed. The ratio of their times of flight is

   1) sinθ:1 2) cosθ:1 3) sinθ:cosθ 4) cosθ:sinθ

MULTIPLE CORRECT CHOICE: **TOTAL MARKS: 16**

9. Which of the following are true in case of a body projected with some initial velocity at an angle $\theta(\neq 90°)$ with horizontal.

   1) Path of a projectile is parabolic only when the acceleration of the projectile is constant.
   2) At the highest point on the path the velocity is not zero
   3) The component of velocity in the direction opposite to that of acceleration (which is constant) is zero at the highest point on the path of the projectile.
   4) For the projectile maximum height occurs when it covers a horizontal distance equal to half of the horizontal range.

10. Mark the false statement(s) about the velocity of a body projected with an angle to the horizontal.

    1) It is always perpendicular to the acceleration.

2) It becomes zero at maximum height
3) It makes zero angle with the horizontal at its maximum height
4) Its direction coincides with the direction of acceleration when the body just before hitting the ground

11. If two projectile A and B are projected with same speed at angles 15° and 75° respectively to the horizontal, then
1) A and B will have same horizontal range
2) Maximum height reached by A is same as that reached by B
3) Maximum height reached by A is less than that reached by B
4) Time of flight of A is less than the time of flight of B

12. An object is projected from the ground with an initial speed u at an angle θ above the horizontal. Neglect air resistance. Which of the following statements about its motion are TRUE?
1) The horizontal component of its velocity remains constant during the entire flight.
2) The vertical component of its velocity changes continuously due to gravity.
3) The acceleration of the projectile becomes zero at the highest point of its path.
4) The path of the projectile is a curved path called a parabola.

PASSAGE TYPE: ***TOTAL MARKS: 20***

In a "Keechaka Vadha" stage show an unhappy guy from audience throws an rotten egg at keechaka. The egg travels a horizontal distance of 15m in 0.75sec before hitting the keechaka's face 1.7m above the stage. The egg is thrown at 2m above the horizontal floor with an initial velocity 19°above the horizontal. Answer the following for this incident.

13. The initial velocity of egg is
1) 10m/s 2) 20m/s 3) 30 m/s 4) 40 m/s

14. The finial velocity of egg is
1) 7m/s 2) 5m/s 3) 10m/s 4) 20m/s

15. The height of the stage above the floor is
1) 5.2m 2) 8.4m 3) 3.5m 4) 2.7m

A football is kicked from the ground with an initial speed of 20 m/s making an angle of 30° with the horizontal. Assume that the acceleration due to gravity g = 10 m/s^2 and neglect air resistance. The horizontal component of the initial velocity is u cos30° and the vertical component is u sin30°. For such a projectile:

• Time of flight, T = 2u sinθ / g
• Horizontal range, R = u^2 sin2θ / g

(Take sin30° = 1/2, cos30° ≈ 0.87 and sin60° ≈ 0.87.)

16. What is the time of flight of the football before it lands back on the ground?
1) 1 s 2) 2 s 3) 3 s 4) 4 s

17. Using the information in the passage, what is the horizontal range of the football (the horizontal distance from the point where it is kicked to the point where it lands)?
1) 20 m 2) 30 m 3) 35 m (approximately) 4) 40 m

INTEGER(NUMERICAL VALUE): ***TOTAL MARKS: 4***

18. For the same football kick described in the passage ($u = 20$ m/s, $\theta = 30°$, $g = 10$ m/s^2), what is the maximum height H (in metres) reached by the football above the ground? (Give your answer as an integer.)

MATRIX MATCH: ***TOTAL MARKS: 16***

19. A particle is thrown from the ground with a speed of $2\sqrt{gh}$ at an angle of 60° to the horizontal from a point on the horizontal ground. Match the following.

COLUMN-I	***COLUMN-II***
a) The horizontal range	p) $\sqrt{12h/g}$
b) Time of flight	q) $\sqrt{4h/g}$
c) Maximum height	r) $\sqrt{3h/g}$
d) The time spent by the projectile in reaching maximum height	s) $3h/2$
	t) $2\sqrt{3}h$

20.

COLUMN–1	***COLUMN-II***
a) Vertical component of initial velocity	p)u cosθ
b) Horizontal component of initial velocity	q)u sinθ
c) Time of flight of the projectile	r)2u sinθ / g
d) Maximum height reached by the projectile	s)$u^2 \sin^2\theta / (2g)$