

### QUES 03:-

The trajectory of a projectile near the surface of the earth is given as  $y = 2x - 9x^2$ . If it were launched at an angle  $\theta_0$  with speed  $v_0$  then ( $g = 10 \text{ ms}^{-2}$ ): [Main 12 April 2019 (I)]

(a)  $\theta_0 = \sin^{-1} \frac{1}{\sqrt{5}}$  and  $v_0 = \frac{5}{3} \text{ ms}^{-1}$

(b)  $\theta_0 = \cos^{-1} \left( \frac{2}{\sqrt{5}} \right)$  and  $v_0 = \frac{3}{5} \text{ ms}^{-1}$

(c)  $\theta_0 = \cos^{-1} \left( \frac{1}{\sqrt{5}} \right)$  and  $v_0 = \frac{9}{3} \text{ ms}^{-1}$

(d)  $\theta_0 = \sin^{-1} \left( \frac{2}{\sqrt{5}} \right)$  and  $v_0 = \frac{3}{5} \text{ ms}^{-1}$

ANS

(c) Given,  $y = 2x - 9x^2$   
On comparing with,

$$y = x \tan \theta - \frac{gx^2}{2u^2 \cos^2 \theta},$$

We have,  $\tan \theta = 2$  or  $\cos \theta = \frac{1}{\sqrt{5}}$

and  $\frac{g}{2u^2 \cos^2 \theta} = 9$  or  $\frac{10}{2u^2 (1/\sqrt{5})^2} = 9$

$\therefore u = 5/3 \text{ m/s}$