

QUES 1

A particle is moving with speed $v = b\sqrt{x}$ along positive x -axis. Calculate the speed of the particle at time $t = \tau$ (assume that the particle is at origin at $t = 0$). [Main 12 Apr. 2019 II]

(a) $\frac{b^2\tau}{4}$

(b) $\frac{b^2\tau}{2}$

(c) $b^2\tau$

(d) $\frac{b^2\tau}{\sqrt{2}}$

(b) Given, $v = b\sqrt{x}$

$$\text{or } \frac{dx}{dt} = b x^{1/2} \quad \text{or } \int_0^x x^{-1/2} dx = \int_0^t b dt$$

$$\text{or } \frac{x^{1/2}}{1/2} = 6t \quad \text{or } x = \frac{b^2 t^2}{4}$$

Differentiating w. r. t. time, we get

$$\frac{dx}{dt} = \frac{b^2 \times 2t}{4} \quad (t = \tau)$$

$$\text{or } v = \frac{b^2 \tau}{2}$$