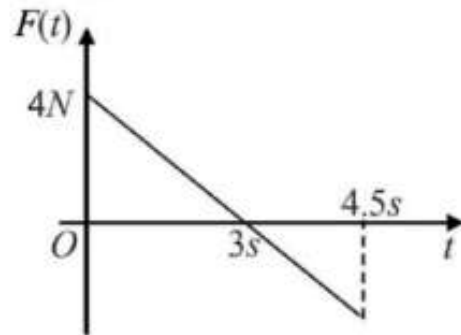**4.** A block of mass 2 kg is free to move along the x-axis. It is at rest and from $t=0$ onwards it is subjected to a time-dependent force $F(t)$ in the x direction. The force $F(t)$ varies with t as shown in the figure. The kinetic energy of the block after 4.5 seconds is

(2010)

(a) 4.50 J

(b) 7.50 J

(c) 5.06 J

(d) 14.06 J

Solution:

Area under F-t graph = momentum

$$= p = \sqrt{2\,km}$$

$$\therefore k = \frac{A^2}{2m} \quad (A = \text{net area of } F - t \text{ graph})$$

$$= \frac{\left\{\left(\frac{4\times3}{2}\right)-\left(\frac{1.5\times2}{2}\right)\right\}^2}{2\times2}$$