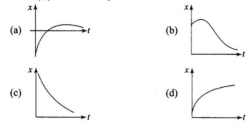
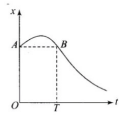


QUES 01

Among the four graphs shown in the figure, there is only one graph for which average velocity over the time interval $(0, T)$ can vanish for a suitably chosen T . Which one is it?



Key concept: Average velocity: It is defined as the ratio of displacement to time taken by the body.
Displacement: Δ Time taken
 According to this problem, we need to identify the graph which is having same displacement for two strings. When there are two strings for same displacement, the corresponding velocities should be in opposite directions.
 As shown in graph (a), the first slope is decreasing that means particle is going in one direction and its velocity decreases, becomes zero at highest point of curve and then increasing in backward direction, hence the particle return to its initial position. So, for one value of displacement there are two different points of time and we know that displacement of a graph gives us the average velocity hence, for one time, slope is positive then average velocity is also positive and for other time slope is negative then average velocity is also negative.
 As there are opposite velocities in the interval $(0, T)$, hence average velocity can vanish in (a).
 This can be seen in the figure given alongside.
 As shown in the graph (a), (b) same displacement for two different points of time.



Important points:

Various position-time graphs and their interpretation

1. Graph: Line parallel to time axis



Interpretation: It represents that the particle is at rest.

2. Graph: Line perpendicular to time axis



Interpretation: It represents that particle is changing its position but time does not change, it means the particle possesses infinite velocity.
 This situation is practically not possible.

3. Graph: Line with constant slope



Interpretation: It represents uniform velocity of the particle.

4. Graph: Parabola bending towards position axis



Interpretation: It represents increasing velocity of the particle. It means the particle possesses acceleration.
 Hence slope of position-time graph goes on increasing.

5. Graph: Parabola bending towards time axis



Interpretation: It represents decreasing velocity of particle. It means the particle possesses retardation.
 Hence slope of position-time graph goes on decreasing.

6. Graph: Line with negative slope



Interpretation: It represents that the particle returns towards the point of reference (negative displacement) with uniform velocity.