

Kinematics Equations of uniformly accelerated Motion by Graphical method.

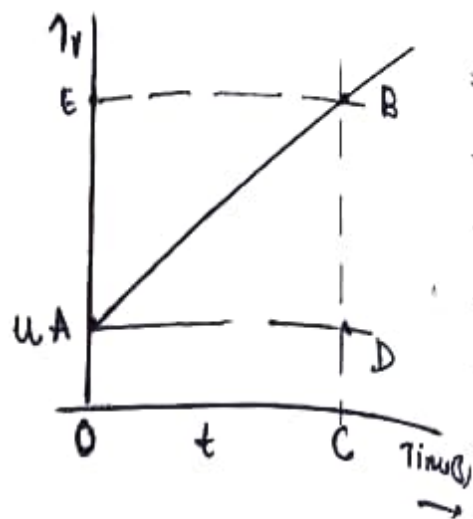
1st equation of motion

Acceleration = $\frac{\text{change in velocity}}{\text{Time taken for change}}$

$$a = \frac{BD}{AD} \quad , \quad a = \frac{AE}{OC} \quad , \quad a = \frac{OE - OA}{OC}$$

$$a = \frac{v - u}{t} \Rightarrow a v - u = at \text{ or}$$

$$v = u + at$$



2nd equation of Motion

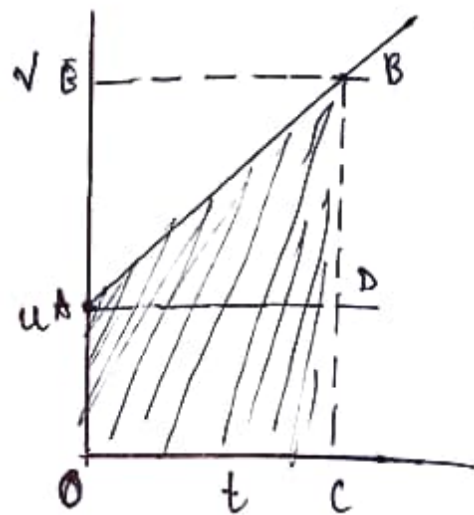
The area of Trap OABC gives distance travelled

$$S = \frac{1}{2} \times OC \times (OA + CB)$$

$$S = \frac{1}{2} \times t \times (u + v)$$

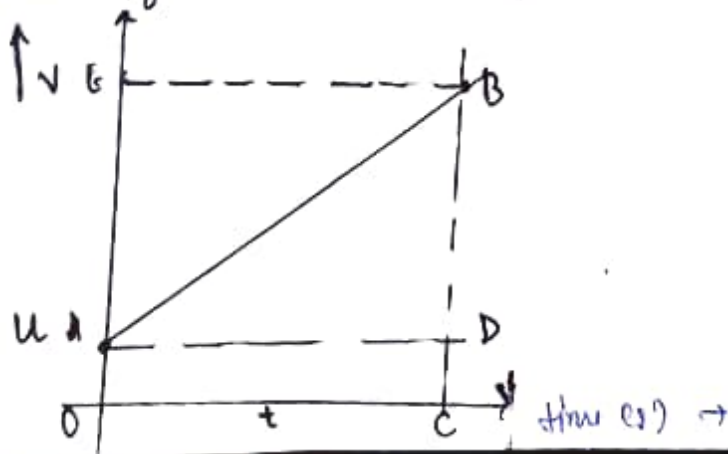
$$S = \frac{1}{2} t (u + u + at)$$

$$S = \frac{1}{2} (2ut + at^2) \Rightarrow S = ut + \frac{1}{2} at^2$$



3rd equation of motion

The area of Trap OABC gives distance travelled



$$S = \frac{1}{2} \times a t \times (OA + OB) \Rightarrow S = \frac{1}{2} t(u + v) \Rightarrow v + u = \frac{2S}{t}$$

From 1st equation of motion we have $v - u = at$
multiplying eqns (1) and (2) we get

$$(v+u)(v-u) = \frac{2S}{t} \times at \Rightarrow v^2 - u^2 = 2as - \text{3rd eq}^n \text{ of motion}$$

Numericals