QUES 03:-

Following are four differrent relations about displacement, velocity and acceleration for the motion of a particle in general. Choose the incorrect one (s) :

i. $v_{av} = \frac{1}{2}[v(t_1) + v(t_2)]$
ii. $v_{av} = \frac{r(t_2) - r(t_1)}{t_2 - t_1}$
iii. r = $\frac{1}{2}$(v(t_2) - v(t_1)(t_2 - t_1))
iv. $a_{av} = \frac{v(t_2) - v(t_1)}{t_2 - t_1}$

Sol. (a, c) When an object covers a displacement Δr in time Δt, its average velocity is given by

$\vec{v}_{avg} = \frac{\overrightarrow{\Delta r}}{\Delta t} = \frac{r_2 - r_1}{t_2 - t_1}$ where r_1 and r_2 are position vectors corresponding to time t_1 and t_2

If the velocity of an object changes from v_1 to v_2 in time Δt, the average acceleration is given by

$a_{av} = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$

But, when acceleration is non-uniform,

$v_{av} \neq \frac{v_1 + v_2}{2}$

Option (c) is similar to the relation $\vec{r} = \frac{1}{2}at^2$ which is not correct if initial velocity is given.

So (b) and (d) are the correct relations for the uniform acceleration.