a train starts its journey with constant acceleration alpha ,attains a velocity v and then moves with v for some distance and then deaccelerates at the rate of beta to come to rest .if the total length of the path covered is L, find out the total time interval of motion

1. Acceleration:

$v = \alpha t_a$

t_a – time of acceleration

$t_a = \frac{v}{\alpha}$

Distance travelled:

$l_a = \frac{\alpha t_a^2}{2} = \frac{v^2}{2\alpha}$

2. Uniform motion:

Distance travelled:

$l_u = v * t_u$

t_u – time of uniform motion

3. Deceleration

$v = \beta t_d$

t_d – time of decceleration

$t_d = \frac{v}{\beta}$

Distance travelled:

$l_d = \frac{\beta t_d^2}{2} = \frac{v^2}{2\beta}$

Total time equals:

$$t = t_a + t_u + t_d = \frac{v}{\beta} + \frac{l_u}{v} + \frac{v}{\alpha}$$

Total distance:

$l = l_a + l_u + l_d$

Therefore: $l_u = l - l_a - l_d = l - \frac{v^2}{2\beta} - \frac{v^2}{2\alpha}$

$$t = \frac{v}{\beta} + \frac{l_u}{v} + \frac{v}{\alpha} = \frac{v}{\beta} + \frac{l - \frac{v^2}{2\beta} - \frac{v^2}{2\alpha}}{v} + \frac{v}{\alpha} = \frac{v}{2\beta} + \frac{l}{v} + \frac{v}{2\alpha}$$

Answer: $t = \frac{v}{2\beta} + \frac{l}{v} + \frac{v}{2\alpha}$