13. RATE OF MEASURE

Synopsis :

1. If ‘s’ is the distance traveled by a particle in time ‘t’, then the relation between s and t can be expressed as s = f(t).

   i) The velocity of the particle v = $\frac{ds}{dt}$ = $f^{I}(t)$.

   ii) If v>0 then S is increasing and the particle is moving from left to right.

   iii) If v<0 then S is decreasing and the particle is moving from right to left.

   iv) If v = 0 the particle comes to rest.

   v) The acceleration of the particle a = $\frac{dv}{dt} = \frac{d^2s}{dt^2}$ = $f^{II}(t)$.

   vi) If a>0 then v is increasing.

   vii) If a<0 then v is decreasing.

2. If P is a point which moves on a curve and θ is the angle made at a fixed point ‘O’ by OP with + ve direction of the x-axis then

   i) The angular velocity of P at ‘O’ is w = $\frac{d\theta}{dt}$.

   ii) The angular acceleration of P at ‘O’ is a = $\frac{d^2\theta}{dt^2}$.

3. A particle moves on the parabola $y^2 = 4ax$. Then the point at which the abscissa and the ordinate increase at the same rate is (a, 2a).

4. A particle moves on the parabola $x^2 = 4ay$. Then the point at which the abscissa and the ordinate increase at the same rate is (2a, a).

5. A particle attains maximum height $\Rightarrow \frac{ds}{dt} = 0$.

6. A particle attains maximum velocity $\Rightarrow \frac{dv}{dt} = 0$.

7. A particle changes its direction $\Rightarrow \frac{ds}{dt} = 0$ and $\frac{d^2s}{dt^2} \neq 0$.