

① wave equation:-

$$y(x,t) = A \sin(\omega t - kx)$$

$$= A \sin\left(\frac{2\pi}{T}t - \frac{2\pi}{\lambda}x\right)$$

$$= A \sin\left(2\pi\left(\frac{x}{\lambda} + ft\right)\right)$$

$y(x,t)$ = displacement as a function of x and time t

A = amplitude of a wave

ω = angular frequency of the wave

k = angular wave number.

f = frequency

λ = wavelength

$$\omega = \frac{2\pi}{T}$$

$$v = f\lambda$$

velocity

$$k = \frac{2\pi}{\lambda}$$

② Speed of travelling wave :-

$$v = \lambda f = \frac{\lambda}{T}$$

$$v = \frac{\omega}{k}$$

③ Speed of transverse wave on stretched string:-

$$v = \sqrt{\frac{T}{\mu}}$$

T = Tension

μ = linear mass density

$$= \frac{m}{L}$$

④ speed of a longitudinal wave (speed of sound) :-

$$v = \sqrt{\frac{B}{\rho}}$$

B = Bulk Modulus of medium

ρ = density.

for solid rod:-

$$v = \sqrt{\frac{Y}{\rho}}$$

Young Modulus