Assignment - 2

Q2. A wave travelling along a string is described by $y(x,t) = 0.00427 \sin(82.1x - 3.27t)$ in which the numerical constants are in S.I units ($0.00427\ m$, $82.1\ rad/m$ and $3.27\ rad/sec$)

a) What is the amplitude of this wave?

b) What are the wave-length, period and freq^{n} of this wave?

c) What is the velocity of this wave?

d) What is the displacement y at $x = 28.5\ cm$ and $t = 15.9\ sec$?

→ The given eqn^{n} is in the form of sinusoidal wave eqn^{n} such as,

$$y = A\sin(kx - \omega t) \quad \text{---} (1)$$

On comparing with the given eqn^{n}, we find,

Amplitude, $A = 0.00427\ m = 4.27\ mm$.

Also, angular wave number, $k = 82.1\ rad/m$

& angular frequency, $\omega = 3.27\ rad/sec$.

$\because k = 2\pi/\lambda \Rightarrow \lambda = 2\pi/k$

$\therefore \lambda = 2\pi/82.1\ rad/m = 0.0765\ m = 7.65\ cm$

$\because \omega = 2\pi\nu \Rightarrow \nu = \omega/2\pi = \frac{3.27}{2\pi} = 0.520\ Hz$

Again, $\because T = \frac{1}{\nu} = \frac{1}{0.520\ Hz} = 1.923\ sec.$

The phase velocity of a wave is given by,

$$v = \omega/k = \frac{3.27\ rad/sec}{82.1\ rad/m} = 3.98\ m/sec.$$

On substituting the value of $x = 28.5\ cm = 0.285\ m$ and $t = 15.9\ sec$ in the above given eqn^{n}, we find

$$y = 1.341\ mm$$