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Dr. Giridhar Kute

8 FEB. 2024. MJC-PHY SEM-II Unit-II

Topic :- Stationary Wave Defination.

When two progressive Waves of similar amplitude, as well as Wavelength, travel with a straight line and in the opposite direction which gets superimposed on each other, it leads to the creation of Stationary Wave.

⇒ **Analytical Equation for Stationary Wave.**

Suppose the progressive Wave of amplitude and wavelength λ travel in the x- axis direction. then

$$y_1 = a \sin 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right) \quad \text{— (1)}$$

This Wave gets reflected from the free end and it passes the x-axis but in the negative direction, then the equ is

$$y_2 = a \sin 2\pi\left(\frac{t}{T} + \frac{x}{\lambda}\right) \quad \text{— (2)}$$

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As per the objective of Superposition the final displacement is.

$$y = y_1 + y_2$$

So from addition Eqn (1) and (11) We get

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

$$y = a.2\sin\left(2\pi\frac{t}{T}\right).\cos\left(2\pi\frac{x}{\lambda}\right)$$

$$\Rightarrow \boxed{y = 2a\cos\left(2\pi\frac{x}{\lambda}\right).\sin\left(2\pi\frac{t}{T}\right)} \quad \text{--- (3)}$$

Eqn (3) is the Eqn of Stationary wave.