ASSIGNMENT11.15_13Q

EE22BTECH11219 - Sai Sujan Rada

QUESTION:

Given below are some functions of x and t to represent the displacement (transverse or longitudinal) of an elastic wave. State which of these represents (*a*) travelling wave, (*ii*) a stationary wave or (*iii*) none at all:

(a) $y = 2\cos(3x)\sin(10t)$

(b) $y = 2\sqrt{x - vt}$

(c) $y = 3\sin(5x - 0.5t) + 4\cos(5x - 0.5t)$

(d) $y = \cos x \sin t + \cos 2x \sin 2t$

SOLUTION:

TRAVELLING WAVE	STATIONARY WAVE
$y(x,t) = A\sin(kx \pm \omega t)$	$y(x,t) = A\sin kx\cos\omega t$

PARAMETERS	DEFINITION
A	Amplitude
ω	Angular Velocity
x	Position
k	Wavenumber

TABLE I
TRAVELLING WAVE *vs* STATIONARY WAVE

Let us assume an equation:

$$A(x)\cos(\omega t + \phi(x))$$

STATIONARY WAVE CONDITION	TRAVELLING WAVE CONDITION
$A(x) = A_0\sin(\omega t + \alpha)$	$A(x) = k$
$\phi(x) = k$	$\phi(x) = kx + c$

TABLE II
TRAVELLING WAVE *vs* STATIONARY WAVE

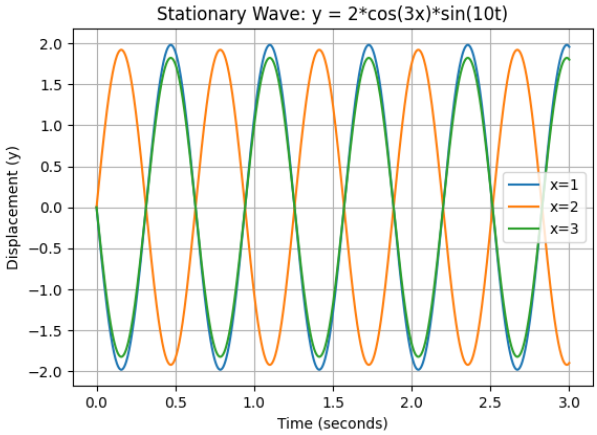

Fig. 1. DIPLACEMENT *vs* TIME-graph1

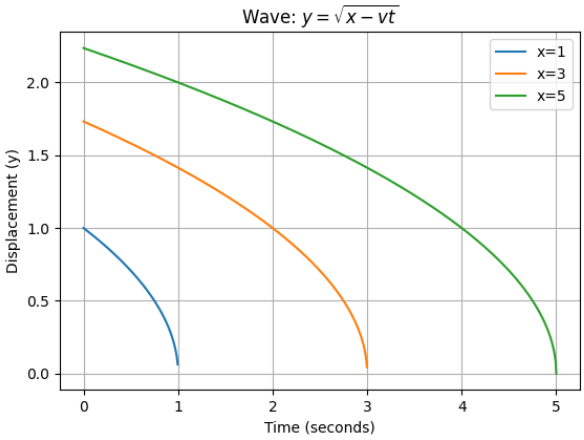

Fig. 2. DIPLACEMENT *vs* TIME-graph2

The figures Fig. 1 and Fig. 3 are self explanatory for stationary and travelling waves.
The figures Fig. 2 and Fig. 4 are neither stationary nor travelling waves.

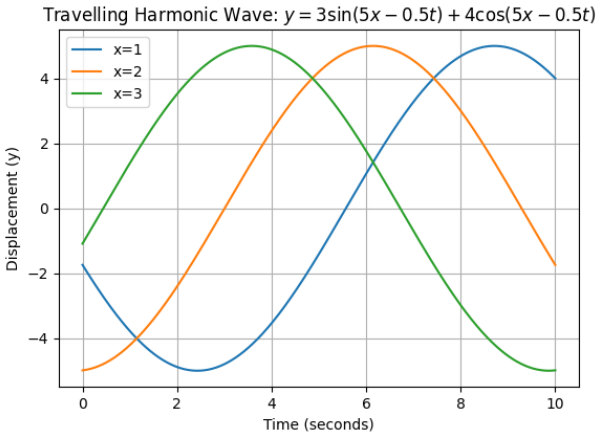

Fig. 3. DIPLACEMENT *vs* TIME-graph3

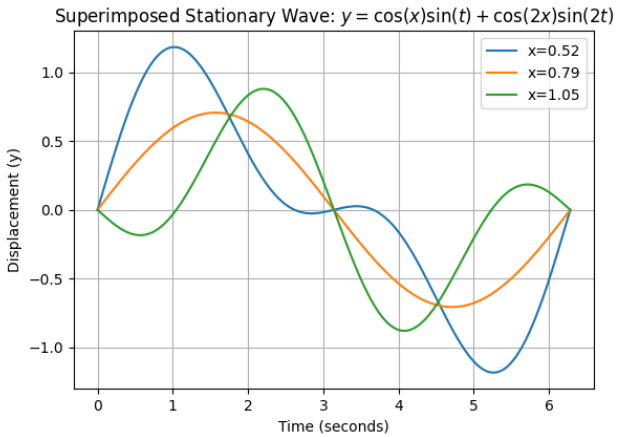

Fig. 4. DIPLACEMENT *vs* TIME-graph3