

ASSIGNMENT11.15 _ 13Q

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

The given equation represents a stationary wave because the harmonic terms kx and ωt appear separately in the equation. This equation actually represents the superposition of two stationary waves.

SOLUTION:

(a) The given equation is: $y = 2 \cos(3x) \sin(10t)$

As the given equation is similar to the standard standing wave equation, so the given wave is a stationary wave.

(b) The given equation is: $y = 2 \sqrt{x - vt}$

The given equation does not contain any harmonic term. Therefore, it does not represent either a travelling wave or a stationary wave.

(c) The given equation is: $y = 3 \sin(5x - 0.5t) + 4 \cos(5x - 0.5t)$

As the given equation is similar to the standard harmonic wave equation, so the provided wave is a travelling harmonic wave.

(d) The given equation is: $y = \cos x \sin t + \cos 2x \sin 2t$