Assignment-1

EE:1205 Signals and Systems
Indian Institute of Technology, Hyderabad

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I. Question 12.15.1

A string of mass 2.50 kg is under a tension of 200 N. The length of the stretched string is 20.0 m. If the transverse jerk is struck at one end of the string, how long does he disturbance take to reach the other end ?

II. Solution

We know

$$M = 2.5kg \tag{1}$$
$$T = 200N \tag{2}$$
$$l = 20.0m \tag{3}$$

Mass per unit length

$$\mu = \frac{M}{l} = \frac{2.5}{20} = 0.125\ kgm^{-1} \tag{4}$$

The velocity (v) of the transverse wave in the string is given by the relation

$$v = \sqrt{\frac{T}{\mu}} \tag{5}$$
$$= \sqrt{\frac{200}{0.125}} \tag{6}$$
$$= 40\ m/s \tag{7}$$

Calculating the time taken,

$$t = \frac{l}{v} = \frac{20}{40} = 0.5\ s \tag{8}$$

Hence, the time taken to reach the other end of the string is 0.5 s