11.9.4.4

EE23BTECH11027 - K RAHUL*

QUESTION:

A steel wire has a length of 12.0 m and a mass of 2.10 kg. What should be the tension in the wire so that speed of a transverse wave on the wire equals the speed of sound in dry air at 20°C = 343 ms^{-1}

SOLUTION:

Symbol	Description	Value
v	Velocity of wave on string	343 ms^{-1}
T	Tension in the string	
μ	Linear Mass Density	0.175 kgm^{-1}

TABLE 0
PARAMETERS

$$v = \sqrt{\frac{T}{\mu}} \tag{1}$$

$$T = v^2\mu \tag{2}$$

$$= (343)^2(0.175) \tag{3}$$

$$= 20.59kN \tag{4}$$

Thus, tension in the string is 20.59kN