Chapter 16 (Waves-I)

1- The equation for a standing wave is given by: $y = 4.00\times10^{-3}\sin(2.09\,x)\cos(60.0\,t)$ (SI units). What is the distance between two consecutive antinodes? (A: 1.50 m)

2- A string under a tension of 15 N, is set into vibration to produce a wave of speed 20 m/s, and a maximum transverse speed of 8 m/s. For this wave, the average power is: (A: 24 W)

3- Standing waves are produced in a string at the two consecutive resonant frequencies 155 and 195 Hz. If the mass of the string is 5.00 g and its length is 0.80 m, then the tension applied to the string should be: (A: 25.6 N)

4- A transverse wave in a 3.0 m long string is given by the harmonic wave equation: $y = 0.4\cos[\pi\times(x/4 + 6t)]$ (SI units). If the string is kept under a constant tension of 70 N, find the power transmitted to the wave. (A: 83 W)

5- A sinusoidal wave traveling in the positive *x*-direction has an amplitude of 10 cm, a wavelength of 20 cm, and a frequency of 5.0 Hz. A particle at $x = 0$ and $t = 0$ has a displacement of 10 cm. Write the equation of the displacement of the particles as a function of *x* and *t*. (A: $y = (0.1\text{ m})\sin[\pi\times(10x-10t-3/2)]$)

6- A harmonic wave is described by $y = 0.2\times\sin(25x-10t)$ (SI units). How far does a wave crest move in 20 sec? (A: 8 m)

7- The equation of a wave traveling along a string, under a tension of 10 N, is given by: $y = (6.0\text{ cm})\sin(0.02\times\pi\,x + 40.0\times\pi\,t)$, where *x* is in centimeters and *t* is in seconds.
Determine the mass per unit length of the string. (A: 25 g/m)

8- A transverse sinusoidal wave traveling in the negative x direction has an amplitude of 10.0 cm, a wavelength of 20.0 cm, and a frequency of 8.00 Hz. Write the expression for *y* as a function of *x*(in meters) and t(in seconds)if $y(0,0) = 10.0$ cm. (A: $y = (0.1\text{ m})\sin[31.4x+50.3t+(\pi/2)]$)

9- A sinusoidal wave is described as: $y = (0.1\text{ m})\sin[10\times\pi\,(x/5 + t - 3/2)]$, where *x* is in meters and *t* is in seconds. What are the values of its frequency(f), and its velocity(v)? (A: f =5 Hz, v = 5 m/s moving in - *x*-direction)

10- A 100-Hz oscillator is used to generate a sinusoidal wave, on a string, of wavelength 10 cm. When the tension in the string is doubled, the oscillator produces a wave with a frequency and wavelength of: (A: 100 Hz and 14 cm)

11- The lowest resonant frequency, in a certain string clamped at both ends, is 50 Hz. When the string is clamped at its midpoint, the lowest resonant frequency is: (A: 100 Hz)