# HW-CHAPTER-17 (Dr. M.A. Gondal-Phys102.25-27)

**FIRST MAJOR T-041**

**HW☞ ( 1)** A transverse sinusoidal wave is traveling on a string with a speed of 300 m/s. If the wave has a frequency of 100 Hz, what is the phase difference between two particles on the string that are 85 cm apart? A1 1.8 radians.

**2)** Figure 2 shows the displacements at the same instant for two waves, P and Q, of equal frequency and having amplitude Y and 2*Y, respectively. If the two waves move along the positive x-direction, what is the amplitude of the resultant wave, and the phase difference between the resultant wave and the wave P? A1 Resultant amplitude is Y, and the phase difference is Pi.

**HW☞**Q 3 A 50 cm long string with a mass of 0.01 kg is stretched with a tension of 18 N between two fixed supports. What is the resonant frequency of the longest wavelength on this string? A1 30 Hz.

**4 )** A transverse sinusoidal wave of frequency 100 Hz is traveling along a stretched string with a speed of 20.0 m/s. What is the shortest distance between a crest and a point of zero transverse acceleration? A1 0.05 m.

**FIRST MAJOR T-041**

**2)** A wave in a string, is given by the equation: **y(x,t) = 0.24 sin(3.0x-24t),** where x and y are in meters and t is in seconds. Calculate the magnitude of the transverse speed at x = 2.0 m and t = 1.0 s. **[Ans:** 3.8 m/s

**FIRST MAJOR T-032**

**1)** A water wave is described by the equation: **y(x,t) = 0.40 cos [0.10(x + 3t)]** , where x and y are in meters and t is in seconds. The maximum transverse speed of the water molecules is **[Ans**: 0.12m/s

**HW☞2)** Two identical waves, moving in the same direction, have a phase difference of Pi/2. The amplitude of each of the two waves is 0.10 m. If they interfere, then the amplitude of the resultant? **[Ans:** 0.14m/s

**HW☞3)** A wave of speed 20 m/s on a string, fixed at both ends, has an equation for a standing wave given by:

**y(x,t) = 0.05 sin(k x) cos(30 t),** where x and y are in meters and t is in seconds. What is the distance between two consecutive nodes? **[Ans:** 2.1m

**HW☞4)** A 40 cm string of linear mass density 8.0 g/m is fixed at both ends. The string is driven by a variable frequency audio oscillator ranged from 300 Hz to 800 Hz. The string is set in oscillation only at the frequencies of 440 and 600 HZ. Find the tension in the string. **[Ans:** 248 N

**5)** Consider a wave described by the equation**: y(x,t) = A cos (kx-wt).** At t = 0, the displacement is zero at x= **: [Ans:** ¼ wavelength, 3/4 wavelength

**FIRST MAJOR T-031**

**1)** A sinusoidal wave, given by the equation: **y(x,t) = 0.07 cos(6.0 x – 30 t ),** where x and y are in meters and t is in seconds, is moving in a string of linear density =1.2 g/m. At what rate is the energy transferred by the wave? **[Ans**: $1.32*10^{-2}$W

**HW☞3)** A wave in a string of linear density 0.13 g/m, is given by the equation: **y(x,t) = 0.018 sin(3.0 x – 24 t),** where x and y are in meters and t is in seconds. The tension in the string is: **[Ans:** $8.32*10^{-3}$ N

**HW☞4)** Two identical sinusoidal waves, are out of phase with each other, travel in the same direction. They interfere and produce a resultant wave given by the equation: **y(x,t)= 8.0*10**(-4) sin(4.0 x - 8.0 t + 1.57 rad),** where x and y are in meters and t is in seconds. What is the amplitude of the two interfering waves? **[Ans**: 0.5 m

**First major (T-012)**

**1)** What is the wave speed of a transverse wave on a string described by **: y=(2.0 mm) sin[10.0 x-100 t},** where x is in meters and t is seconds. **[Ans:10 m/s**

**HW☞2)** A string has a mass density of 0.10 kg/m and it is under tension of 10.0 N. What must be the frequency of traveling waves of amplitude 10.0 mm for the average power to be 0.5 W? **[Ans**: 16 Hz

**3)**Two identical waves moving in the same direction along a stretched string, interfere with each other. The amplitude of each wave is 10.0 mm and the phase difference between them is 0.80 radian. What is the amplitude of the resultant wave? **[Ans:** 14 mm.

**HW☞4)**A string that is stretched between two supports separated by 1.0 m has resonant frequencies of 500 Hz and 450 Hz, with no intermediate resonant frequencies, what is the wave speed in the string**? [Ans**: 50m/s

**First major (T-002)**

**2)** A sinusoidal wave is described as: **y = (0.1 m) * sin[10*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**)? [Ans**: f=5Hz, v=5m/s in –X direction

**HW☞ 3)** 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**:**
**[Ans**:100 Hz and 14 cm

**4)** 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: **[Ans:** 1.50 m

**HW☞ 5)**The equation for a standing wave is given by: **y = 4.00*10**(-3) sin(2.09 x) cos(60.0 t)** (SI units). What is the distance between two consecutive antinodes? **[Ans:**1.5 m

**First major (T-001)**

**2)** A sinusoidal wave is described as: **y = (0.1 m) * sin[10*pi*(x/5 + t –3/2)]** , where x is in meters and t is in seconds. What are the values of its frequency(£), and its velocity(v)? **[Ans:** 50 Hz

**8)** A standing wave is established in a 3.0-m-long string fixed at both ends. The string vibrates in three segments with an amplitude of 1.0 cm. If the wave speed is l00 m/s, what is the frequency? **[Ans:** 50 Hz

**HW☞ 11)**The maximum amplitude of a standing wave on a string, with linear density = 3.00 grams/m and tension of 15.0 N, is 0.20 cm. If the distance between adjacent nodes is 12.0 cm, what will be the wave function y(x,t) of the standing wave? (Note that x is in centimeters and t is in seconds.) **[Ans:** y(x,t) 0.2 $\sin(0.262x)\cos(1.85*10^{3}t)$

## Book HW Problems P 6, P14, P24, P28, P33