Question 47
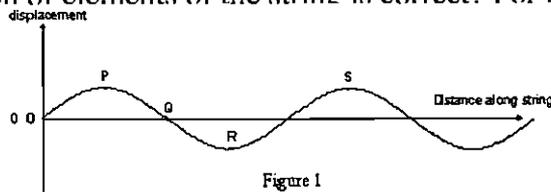
Figure 1 shows the snap shot of part of a transverse wave traveling along a string. Which statement about the motion of elements of the string is correct? For the element at

Figure 1

(a)   Q, its displacement is a maximum.
(b)   Q, its speed is zero.
(c)   S, the magnitude of its acceleration is a maximum.
(d)   P, its speed is a maximum.
(e)   S, the magnitude of its acceleration is zero.

17-9   Interference of Waves

Question 48

Two harmonic waves are described by $y1 = 0.02*\sin[pi*(2x-120t)]$ and $y2 = 0.02*\sin[pi*(2x-120t-0.5)]$(SI units). What is the amplitude of the resultant wave?

(a)   28 mm
(b)   0 mm
(c)   20 mm
(d)   10 mm
(e)   50 mm

Question 49
Fully DESTRUCTIVE interference between two sinusoidal waves of the same frequency and amplitude occurs only if they:

(a)   travel in the same direction and are 90 degrees out of phase
(b)   travel in opposite directions and are in phase
(c)   travel in the same direction and are 180 degrees out of phase
(d)   travel in the same direction and are in phase
(e)   travel in opposite directions and are 90 degrees out of phase

Question 50
The path difference between two waves is 5 m. If the wavelength of the waves emitted by the two sources is 4 m, what is the phase difference (in degrees)?

(a)   75
(b)   45
(c)   320
(d)   180
(e)   450

Question 51
Two harmonic waves traveling in the same medium are described by

$$y1 = 12 \sin (3*pi*x-5*pi*t)$$
$$y2 = 12 \sin (3*pi*x-5*pi*t - 4)$$

where x and y are in meters and t is in seconds. What is the displacement of the resultant wave at x= 1.0 m and t= 1.0 s?

(a)   -10 m
(b)   1.4 m
(c)   9.1 m
(d)   -1.6 m
(e)   -3.2 m

17-09

Question 52
Two waves are described as follows:

$y1(x,t) = 4 (x-v*t)$

$y2(x,t) = 4 (x+v*t)$

At what position and time do these two waves cancel?
(a)   At x = 0 and at t = 0 only.
(b)   They always cancel because v has opposite signs.
(c)   They never cancel (they always add up).
(d)   At t = 0 and at any position x.
(e)   At x = 0 and at any time t.

17-09

Question 53
A transverse harmonic wave in a string is described by:

$y(x,t) = (3.0 m) * sin(0.3x-8t-Phi)$,

where x is in meters and t is in seconds. At t = 0 and x = 0, a point on the string has a positive displacement and has velocity of 0. The phase constant (Phi) is:
(a)   135 degrees.
(b)   270 degrees.
(c)   90 degrees.
(d)   45 degrees.
(e)   180 degrees.

17-09

Question 54
Two harmonic waves are described by:

$y1(x,t) = 4 sin(8x-300t)$,

$y2(x,t) = 4 sin(8x-300t-2)$,

where x is in centimeters and t is in seconds. What is the frequency of the resultant wave?
(a)   24 Hz.
(b)   38 Hz.
(c)   48 Hz.
(d)   33 Hz.
(e)   75 Hz.

17-09
0.37-31%

Question 55
The resultant wave, of two interfering waves, moving in the same direction is given by:

$y(x,t) = 10.0*cos(Pi/6)*sin(3.0*x + 20*Pi*t + Pi/6)$.

One of the two originally interfering waves could be:
(a) $y(x,t) = 5.0 sin(3.0*x + 20*Pi*t + Pi/3)$.
(b) $y(x,t) = 10.0 sin(3.0*x + 20*Pi*t + Pi/3)$.
(c) $y(x,t) = 5.0 sin(3.0*x + 20*Pi*t + Pi/6)$.
(d) $y(x,t) = 10.0 sin(3.0*x - 20*Pi*t)$.
(e) $y(x,t) = 10.0 sin(3.0*x + 20*Pi*t)$.

17-09
0.54-41%

Question 56
A sinusoidal wave of frequency 400 Hz has a speed of 330 m/s. How far apart are two points that differ in phase by Pi/2 ?
(a)   .21 m
(b)   0.032 m
(c)   0.137 m
(d)   0.206 m
(e)   0.825 m

17-09

Question 57   ).63-49%

Two identical sinusoidal traveling waves are moving in the same direction along a stretched string. The amplitude of the resultant wave is 1.80 times that of the common amplitude of the two combining waves. What is the phase difference between the two waves ?
(a)   25.8 degrees
(b)   51.7 degrees
(c)   90.0 degrees
(d)   180 degrees
(e)   18.0 degrees

17-09

Question 58   0.40-28%

The equation for a transverse wave on a string is:
$$y(x,t) = 10.0*\sin(0.157*x-50.3*t)$$
where x and y are in centimeters and t is in seconds. At a given time, how far apart are two points that differ in phase by Pi/2 radians ?
(a)   10.0 cm
(b)   5.00 cm
(c)   0.120 cm
(d)   18.0 cm
(e)   40.0 cm

17-09

Question 59   0.59-53%

Two sinusoidal waves having the same amplitude (A), frequency and wavelength, travel in the same direction and have a phase difference Phi. Which one of the following statements is TRUE ?
(a)   Their interference will be constructive if Phi = 100 Pi.
(b)   Their interference will be constructive if Phi = Pi.
(c)   For certain values of Phi, the amplitude of the resultant reaches 4A.
(d)   The frequency of the resultant wave is twice the original frequency.
(e)   The resultant wave will be a standing wave for Phi = 0.

17-09

Question 60

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:
$$y(x,t)= 8.0*10**(-4) \sin(4.0x-8.0t+1.57 \text{ rad}),$$
where x and y are in meters and t is in seconds. What is the amplitude of the two interfering waves?
(a)   1.0 m.
(b)   4.0 m.
(c)   0.5 m.
(d)   2.5 m.
(e)   0.2 m.

17-09

Question 61   0.44-34%

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 wave is:
(a)   1.12 m.
(b)   0.05 m.
(c)   0.14 m.
(d)   0.21 m.
(e)   Not enough information is given to solve this question.

17-09

Question 62
0.44-24%

Two identical sinusoidal waves are traveling along a stretched string, both moving in the negative x direction. The two waves are out of phase by Pi radians. The amplitude of each wave is 1.00 cm and their frequency is 100 Hz. What is the displacement of the string at x=0 when t=10.0 s?
(a)   2.00 cm
(b)   1.41 cm
(c)   0.71 cm
(d)   1.00 cm
(e)   zero

17-09

Question 63
0.35-18%

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?
(a)   0.6 radians.
(b)   4.1 radians.
(c)   1.8 radians.
(d)   3.4 radians.
(e)   5.6 radians.

17-09

Question 64
0.31-66%

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?
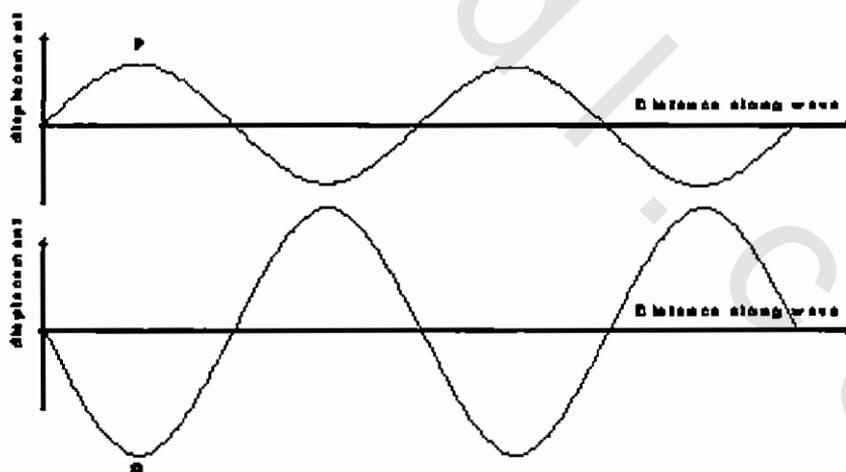
The waves are superimposed to give a resultant wave.

Figure 2

(a)   Resultant amplitude is Y, and the phase difference is Pi.
(b)   Resultant amplitude is 2*Y, and the phase difference is Pi.
(c)   Resultant amplitude is 3*Y, and the phase difference is Pi.
(d)   Resultant amplitude is Y, and the phase difference is zero.
(e)   Resultant amplitude is 2*Y, and the phase difference is zero.