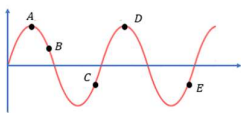


Wave Motion

Introduction and progressive wave:

- When the propagation of a longitudinal wave through a material medium takes place, the quantities transmitted in the direction of propagation are:
 - energy, momentum and mass
 - energy
 - energy and mass
 - energy and linear momentum
- A wave is propagating along a string and the displacement of particle along y-axis is given by $y(x, t) = A \cos(\omega t + kx)$. This represents:
 - A transverse wave along +ve x-axis
 - A transverse wave along -ve x-axis
 - A longitudinal wave along +ve x-axis
 - A longitudinal wave along -ve x-axis
- The distance between two consecutive crests in a wave train produced in a string is 5 cm. If 2 complete waves pass through medium per second, then the velocity of wave is:
 - 2.5 cms^{-1}
 - 5 cms^{-1}
 - 10 cms^{-1}
 - 15 cms^{-1}
- The equation of a wave is represented by: $y = 10 \sin(100t - x/10)$. The velocity of the wave will be:
 - 100 m/s
 - 250 m/s
 - 750 m/s
 - 1000 m/s
- The distance between two points differing in phase by 60° on a wave having a wave velocity 360 m/s & frequency 500 Hz is:
 - 0.72 m
 - 0.18 m
 - 0.36 m
 - 0.
- The equation of a traveling wave is $y = 60 \cos(1800t - 6x)$ where y is in microns t in secs and x in meter. The ratio of maximum particle velocity to wave velocity is
 - 3.6×10^{-11}
 - 3.6×10^{-6}
 - 3.6×10^{-4}
 - 3.6×10^{-2}
- Figure shows a sinusoidal wave at a given instant which points are in phase?
 - A, B
 - B, D
 - C, E
 - B, C



- If you are walking on the moon surface, can you hear the cracking sound behind you? Explain. [2]
 - Longitudinal wave is called as pressure wave, why? [2]
 - For a travelling wave: $y = 2.0 \cos(10t - 0.8x + 0.35)$, where x & y are in m, t in seconds. What is the difference between oscillatory motions at two points separated by a distance of: (i) 4 m & (ii) $3\lambda/4$? [(i) **3.2 rad** (ii) **4.7 rad**] [2]
 - A wave has frequency of 5KHz and amplitude 0.2 mm . Find maximum particle velocity. [**$2\pi \text{ m/s}$**] [2]
- Define progressive wave. Derive equation of progressive wave. [3]
 - A wave has the equation: $y = 0.02 \sin(30t - 4x)$, y and x in meters and t in seconds. Find (i) frequency (ii) wavelength (iii) speed. [**4.8Hz, 1.6m, 7.5m/s**] [2]
 - A radio station broadcasts at 700KHz. If the radio waves travel with a speed of $3 \times 10^8 \text{ m/s}$, calculate the wavelength of radio waves. [**428.6m**] [2]

Principle of superposition and Stationary wave:

- Two identical sinusoidal waves each of amplitude 10 mm with a phase difference of 90° are travelling in the same direction in a string. The amplitude of the resultant wave is
 - 5 mm
 - $10\sqrt{2} \text{ mm}$
 - 10 mm
 - 20 mm

- The displacement of an elastic wave is given by the function $y = 3 \sin \omega t + 4 \cos \omega t$, where y is in cm and t is in sec. The resultant amplitude is
 - 3 cm
 - 4 cm
 - 5 cm
 - 7 cm
- Two waves produced displacement at a point given by: $y_1 = a \sin \omega t$ & $y_2 = a \sin(\omega t + \pi/2)$. The resultant amplitude is:
 - 0
 - 2a
 - $\sqrt{2}a$
 - $a/\sqrt{2}$
- When a wave is reflected from a denser medium, the change in phase is:
 - 0
 - π
 - 2π
 - 3π
- A stationary wave is represented by: $y = A \sin(100t) \cos(0.01x)$ where A & y are in millimeters, t in sec and x in meter. The velocity of wave is:
 - 10^2 ms^{-1}
 - 10^3 ms^{-1}
 - 10^4 ms^{-1}
 - 10^5 ms^{-1}
- The equation of a stationary wave is $y = 5 \sin \frac{\pi x}{3} \cos 40\pi t$, where x and y in cm and t is second. Then the separation between two consecutive nodes is:
 - 12 cm
 - 6 cm
 - 3 cm
 - 1.5 cm
- In stationary wave the particle velocity at the nodal positions is,
 - maximum and finite
 - minimum but non-zero
 - zero
 - infinite
- The amplitude of superposition of two waves $y_1 = 5 \sin \omega t$ and $y_2 = 5 \cos \omega t$ is,
 - 0
 - 5
 - $5\sqrt{2}$
 - 10
- A standing wave is shown in the figure. The number of nodes and antinodes are,
 - 4 nodes 3 antinodes
 - 3 nodes, 4 antinodes
 - 3 nodes, 3 antinodes
 - 4 nodes, 4 antinodes
- When the sound wave is refracted from air to water, which of the following property of the wave remain unchanged?
 - wavelength
 - wave number
 - wave velocity
 - frequency
- What are stationary waves? Prove that the distance between any two consecutive nodes or consecutive antinodes in a stationary wave is $\lambda/2$. [3]
 - A stretched string of given length resonates in one second as shown in figure.
 - What is the type of wave shown in fig? [1]
 - Discuss the mechanism of formation of wave shown in fig. [2]
 - Determine the frequency, wavelength, propagation constant and speed of the wave. [2]
- Loud sound is produced at node. Why? The distance between two consecutive nodes in a stationary wave is 20cm. If the speed of wave is 330m/s, calculate its frequency. Also find the distance between two consecutive nodes and antinodes. [**825Hz**] [2]
 - How standing waves are different from progressive waves? A standing wave is set up on a string that has a frequency of 120 Hz. The distance between nodes in the pattern is 37 cm. Find (a) wavelength of the wave (b) their speed.

(Ans: a. **74 cm** b. **88.8 ms⁻¹**) [3]
 - State principle of superposition of wave. Write an equation of stationary wave. [1]
 - What is echo? A ship's Sonar sends down a signal through water in which the speed of sound is 1500 m/s. The echo is received after 2 seconds. What is the depth of the sea bed?

