12. Define phase of a wave. Write its unit, Obtain the relation between phase difference and path difference. A sinusoidal wave is given by $y = 008 \sin(kx - \omega t)$ where $k = 2.11 \, rad \, m^{-1}$, $\omega = 3.62 \, rad \, s^{-1}$, $x \, and \, y \, are \, in \, meter$. Determine wavelength, frequency and speed of the wave.
$$(Ans: \lambda = 2.98 \, m, f = 0.576 \, Hz, v = 1.72 m \, s^{-1})$$

13. The distance between two consecutive nodes in a stationary wave is 20cm.if the speed of wave be 330m/s. calculate its frequency?

14. State principle of superposition of waves. Does energy flow in stationary wave? A resultant stationary wave formed due to superposition of two waves is represented by an equation $y = 0.2 \sin(2\pi x) \cos(4\pi t)$, where x and y are in m and t is sec. Calculate the distance between two successive antinodes? $(Ans: 0.5 \, m)$

15. A standing wave having formed between two atoms having a distance of $1.21 \, A^o$ between them as shown in figure.
    a. Define a standing wave. How many nodes and antinodes are there?
    b. Find separation between two successive antinodes.
    c. The louder sound is heard at node. Why?
    $(Ans: 0.605 \, A^o)$

16. Two loud speakers facing each other are 100m apart. They are connected to the same oscillator which gives sound of frequency 110 Hz. A man standing at a distance of 3.75m from one speaker does not hear any sound. He walks toward the other speaker i) at what distance from the first speaker will he hear sound again? ii) at what further distance from the first speaker will hear no sound again? Given velocity o sound is 330m/s? [Ans: 4.50m,5.25m]

17. What is progressive wave? Does its frequency change if it goes from air to water? Obtain the progressive wave equation

18. Define phase difference and path difference. Write an expression for the relation between them. What does it mean that path difference is $0.08m$? If one wave lags another wave having the same wavelength $0.5 \, m$ by phase $\frac{\pi}{3}$ then find the path difference. $(Ans: 0.083m)$

19. What is the nature of mechanical wave on the liquid surface? A wave of wavelength $0.5m$ travels inside water with speed $1500m/s$, find its frequency and time period

20. What are the differences between progressive wave and standing wave. Deduce an equation for progressive wave. The displacement of a wave travelling in x-direction is given by $y = 10^{-4} \sin(600t - 2x)$ where $x \, and \, y \, are \, in \, meter \, and \, t \, is \, in \, second$. Find out the speed of the wave motion. $(Ans: 300 \, m/s)$. What is the phase angle of above equation?

21. A standing wave equation is given by $y = 10 \sin\frac{\pi x}{4} \cos 10\pi t$, $where \, x \, and \, y \, are \, in \, cm$.
    a. Calculate the amplitude of each component wave.
    b. Calculate distance between two consecutive nodes.
    c. Calculate distance between two consecutive antinodes. $(Ans: a. 5 \, cm \quad b. 4 \, cm \quad c. 4 \, cm)$

22. Obtain the conditions of maxima and minima in standing waves. 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.
$$(Ans: a. 74 \, cm \quad b. 88.8 \, ms^{-1})$$

23. The equation of transverse wave traveling along a string is $y = 2 \sin \pi(0.5x - 200t)$ where x and y are in cm and t in sec. Find the amplitude, wavelength, frequency and velocity of propagation.
$$(Ans: 2 \times 10^{-2} \, m, 4 \times 10^{-2} \, m, 100 \, Hz, 4 \, ms^{-1})$$