28. In case of a travelling wave, the reflection at a rigid boundary will take place with a phase change of

    a. $\frac{\pi}{2} radian$ b. $\frac{\pi}{4} radian$ c. $\frac{\pi}{6} radian$ d. $\pi\ radian$

29. A stone is dropped into a well from height 500m, the sound of splash will be heard approximately after time:

    a. $11.5\ sec$ b. $21\ sec$ c. $10\ sec$ d. $14\ sec$

30. A man on the ground finds that when he sees a jet plane just over his head, the sound is heard at an angle of 30° with the vertical from his left. If the velocity of sound is v, the velocity of jet plane must be:

    a. $v/2$ b. $\sqrt{3}v/2$ c. $2v$ d. $(2/\sqrt{3})\ v$

31. Elevation of a cloud is 60° above the horizon. A thunder is heard 8 seconds after the observation of lightning. The speed of sound is 330 m/s. The vertical height of cloud from the ground is:

    a. $8\ x\ 330\ m$ b. $8\ x\ 330\ cos\ 60°\ m$ c. $8\ x\ 330\ sin\ 60°\ m$ d. $8\ x\ 330\ tan\ 60°\ m$

Subjective Questions:

1. The frequency is the fundamental property of a wave. Explain.
2. If you are walking on the moon surface, can you hear cracking sound nearby you? Explain.
3. Can longitudinal wave travel through liquid? Explain. What about transverse wave?
4. We cannot hear explosions on other planets, why?
5. Transverse wave can propagate only through solid. Explain why?
6. A radio station broadcasts at $800\ Hz$. What will be the wavelength of sound? (Velocity of sound is $320 m/s$).
7. What is the phase difference between two consecutive troughs?
   What is the distance between two consecutive crests in transverse wave?
8. Write the equation of plane progressive wave travelling along X-axis with amplitude 0.004 m, time period 0.5 sec and wavelength 0.5 m.   [Ans: $y = 0.004sin4\pi(t - x)$]
9. A transverse wave of amplitude 8 cm and wavelength 100 cm is travelling from left to right along a long horizontal stretched string with a speed of 100 cms^{-1}. The origin is at the left end of the string. At $t = 0$, the left end of the string, at the origin, is at maximum upward displacement. Find: (1) frequency, (2) angular frequency, (3) propagation constant, (4) equation of the wave, (5) transverse displacement and velocity of particle 100 cm to the right of origin at time $t = 2.15\ sec$, (6) maximum speed of a particle.
   Also sketch the wave diagram.
10. A plane progressive wave is represented by the equation: $y = 0.1\ sin\ (200\pi t - \frac{20\pi x}{17})$ where y is displacement in mm, t is in sec and x is the distance from a fixed origin in meters. Find: 1) frequency of wave, 2) wavelength, 3) wave speed, 4) the phase difference between a point of 0.25 m from origin and a point 1.10 m from origin, 5) the equation of wave with double the amplitude and double the frequency but travelling exactly in opposite direction.

     [Ans: $y = 0.2\ sin\ (400\pi t + \frac{40\pi x}{17})$

11. A small piece of cork in a ripple tank oscillates up and down as ripples pass it. If the ripples travel at 0.2 m/s have a wavelength of 15 mm and an amplitude of 5 mm, what is the maximum velocity of the cork?   [Ans: 0.42 m/s]