## DPP 01

Q.1 Two identical strings X and Z made of same material have tension T_X and T_Z in them. If their fundamental frequencies are 450 Hz and 300 Hz, respectively, I then the ratio T_X/T_Z is

(A) 2.25   (B) 0.44   (C) 1.25   (D) 1.5

Q.2 For a transverse wave travelling along a straight ✓ line, the distance between two peaks (crests) is 25 m, while the distance between one crest and one trough is 1.5 m. The possible wavelength (in m) of the waves are

(A) $\frac{1}{1}, \frac{1}{3}, \frac{1}{5}, \dots \dots$ (B) 1,2,3, … …   (C) 1,3,5, … …   (D) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \dots \dots$

Q.3 A transverse wave travels on a taut steel wire with a velocity of v when tension in it is 2.06×10^4 N. When 3 the tension is changed to T, the velocity changed to v/2. The value of T is close to

(A) 10.2×10^2 N   (B) 5.15×10^3 N   (C) 2.50×10^4 N   (D) 30.5×10^4 N

Q.4 A progressive wave travelling along the positive x-direction is represented by $y(x, t) = A\sin(kx - \omega t + \phi)$. Its snapshot at $t = 0$ is given in the figure.
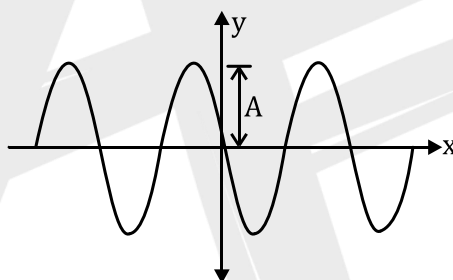
For this wave, the phase ϕ is

(A) $\pi/2$ (B) π (C) 0   (D) $-\pi/2$

Q.5 A small speaker delivers 2 W of audio output. At what distance from the speaker will one detect 120 dB intensity sound? [Given reference intensity of sound as 10^{-12} W/m^2]

(A) 30 cm   (B) 10 cm   (C) 40 cm   (D) 20 cm

Q.6 Equation of travelling wave on a stretched string of linear density 5 g/m is $y = 0.03\sin(450t - 9x)$ where distance and time are measured in SI units. The tension in the string is

(A) 10 N   (B) 7.5 N   (C) 5 N   (D) 12.5 N

Q.7 A travelling harmonic wave is represented by the equation $y(x, t) = 10^{-3}\sin(50t + 2x)$, where x and y are in meter and t is in seconds. Which of the following is a correct statement about the wave?

(A) The wave is propagating along the positive x-axis with speed 25 m s^{-1}.

(B) The wave is propagating along the positive x-axis with speed 100 m s^{-1}.

(C) The wave is propagating along the negative x-axis with speed 25 m s^{-1}.

(D) The wave is propagating along the negative x-axis with speed 100 m s^{-1}.

Q.8 A uniform string of length 20 m is suspended from a rigid support. A short wave pulse is introduced at its lowest end. It starts moving up the string. The time taken to reach the support is (take $g = 10 \text{ m s}^{-2}$)

(A) $2\pi\sqrt{2}$ s   (B) 2 s   (C) $2\sqrt{2}$ s   (D) $\sqrt{2}$ s

Q.9 The transverse displacement $y(x, t)$ of a wave on a string is given by $y(x, t) = e^{-(ax^2 + bt^2 + 2\sqrt{ab}xt)}$

This represents a

(A) wave moving in +x-direction with speed $\sqrt{\dfrac{a}{b}}$

(B) wave moving in −x-direction with speed $\sqrt{\dfrac{b}{a}}$

(C) standing wave of frequency $\sqrt{b}$

(D) standing wave of frequency $\dfrac{1}{\sqrt{b}}$

Q.10 The equation of a wave on a string of linear mass density 0.04 kg m^{-1} is given by

$$y = 0.02(\text{ m})\sin \left[2\pi \left(\frac{t}{0.04(\text{ s})} - \frac{x}{0.50(\text{ m})}\right)\right]$$

The tension in the string is

(A) 6.25 N   (B) 4.0 N   (C) 12.5 N   (D) 0.5 N

ANSWER KEY

1.	(A)	2.	(A)	3.	(B)	4.	(B)	5.	(C)	6.	(D)	7.	(C)
8.	(C)	9.	(B)	10.	(A)								