PREVIOUS YEARS' QUESTIONS EXERCISE-II

1. Tube A has both ends open while tube B has one end closed, otherwise they are identical. The ratio of fundamental frequency of tubes A and B is- **[AIEEE - 2002]**

(1) 1 : 2 (2) 1 : 4
(3) 2 : 1 (4) 4 : 1

2. A tuning fork arrangement (pair) produces 4beats/s with one fork of frequency 288 cps. A little wax is placed on the unknown fork and it then produces 2 beats/s. The frequency of the unknown fork is- **[AIEEE - 2002]**

(1) 286 cps (2) 292 cps
(3) 294 cps (4) 288 cps

3. A wave $y = a\sin(\omega t - kx)$ on a string meets with another wave producing a node at $x = 0$. Then the equation of the unknown wave is- **[AIEEE - 2002]**

(1) $y = a\sin(\omega t + kx)$
(2) $y = -a\sin(\omega t + kx)$
(3) $y = a\sin(\omega t - kx)$
(4) $y = -a\sin(\omega t - kx)$

4. Length of a string tied to two rigid supports is 40 cm. Maximum length (wavelength in cm) of a stationary wave produced on it, is- **[AIEEE - 2002]**

(1) 20 (2) 80
(3) 40 (4) 120

5. The displacement y of a wave travelling in the x-direction is given by

$$y = 10^{-4}\sin\left(600t - 2x + \frac{\pi}{3}\right) \text{ metre,}$$

where, x is expressed in metres and t in seconds. The speed of the wave-motion, in ms^{-1} is- **[AIEEE - 2003]**

(1) 300 (2) 600
(3) 1200 (4) 200

6. A tuning fork of known frequency 256 Hz makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was- **[AIEEE - 2003]**

(1) (256 + 2) Hz (2) (256 – 2) Hz
(3) (256 – 5) Hz (4) (256 + 5) Hz

7. When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2 ? **[AIEEE - 2005]**

(1) 200 Hz (2) 202 Hz
(3) 196 Hz (4) 204 Hz

8. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. what is the percentage increase in the apparent frequency ? **[AIEEE - 2005]**

(1) zero (2) 0.5%
(3) 5% (4) 20%

9. A whistle producing sound waves of frequencies 9500 Hz and above is approaching a stationary person with speed v ms^{-1}. The velocity of sound in air is 300 ms^{-1}. If the person can hear frequencies upto a maximum of 10,000 Hz, the maximum value of v upto which he can hear the whistle is- **[AIEEE - 2006]**

(1) $15\sqrt{2}$ ms^{-1} (2) $15/\sqrt{2}$ ms^{-1}
(3) 15 ms^{-1} (4) 30 ms^{-1}

10. A sound absorber attenuates the sound level by 20 dB. The intensity decreases by a factor of- **[AIEEE - 2007]**

(1) 1000 (2) 10000
(3) 10 (4) 100

11. While measuring the speed of sound by performing a resonance column experiment, a student gets the first resonance condition at column length of 18 cm during winter. Repeation the same experiment during sumer, student measures the column length to be x cm for the second resonance. Then **[AIEEE - 2008]**

(1) $18 > x$ (2) $x > 54$
(3) $54 > x > 36$ (4) $36 > x > 18$

12. A wave travelling along the x-axis is described by the equation $y(x, t) = 0.005 \cos(\alpha x - \beta t)$. If the wavelength and the time period of the wave in 0.08m and 2.0 s respectively then α and β in appropriate units are **[AIEEE - 2008]**

(1) $\alpha = 25.00\pi, \beta = \pi$

(2) $\alpha = \frac{0.08}{\pi}$, $\beta = \frac{2.0}{\pi}$

(3) $\alpha = \frac{0.04}{\pi}, \beta = \frac{1.0}{\pi}$

(4) $\alpha = 12.50\pi$, $\beta = \frac{\pi}{2.0}$

13. Three sound waves of equal amplitudes have frequencies $(\nu-1)$, ν, $(\nu+1)$. They superpose to give beats. The number of beats produced per second will be :- **[AIEEE - 2009]**

(1) 2 (2) 1

(3) 4 (4) 3

14. A motor cycle starts from rest and accelerates along a straight path at 2 m/s^2. At the starting point of the motor cycle there is a stationary electric siren. How far has the motor cycle gone when the driver hears the frequency of the siren at 94% of its value when the motor cycle was at rest ?

(Speed of sound = 330 ms^{-1}) :- **[AIEEE - 2009]**

(1) 147 m (2) 196 m

(3) 49 m (4) 98 m

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

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

The tension in the string is : **[AIEEE - 2010]**

(1) 6.25 N (2) 4.0 N

(3) 12.5 N (4) 0.5 N

16. The transverse displacement y(x, t) of a wave on a string is given by

$$y(x,t) = e^{-\left(ax^2+bt^2+2\sqrt{ab}xt\right)}$$

This represents a :- **[AIEEE - 2011]**

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

(2) standing wave of frequency $\frac{1}{\sqrt{b}}$

(3) wave moving in +x directionwith speed $\sqrt{\frac{a}{b}}$

(4) wave moving in –x direction with speed $\sqrt{\frac{b}{a}}$

17. **Statement-1** :

Two longitudinal waves given by equations :

$y_1(x, t) = 2a \sin(\omega t - kx)$ and $y_2(x, t) = a \sin(2\omega t - 2kx)$ will have equal intensity.

Statement-1:

Intensity of waves of given frequency in same medium is proportional to square of amplitude only.

[AIEEE - 2011]

(1) Statement-1 is false, statement-2 is true.

(2) Statement-1 is true, statement-2 is false.

(3) Statement-1 is true, statement-2 true; statement-2 is the correct explanation of statement-1

(4) Statement-1 is true, statement-2 is true; statement -2 is not correct explanation of statement-1.

18. A travelling wave represented by $y = A \sin(\omega t - kx)$ is superimposed on another wave represented by $y = A \sin(\omega t + kx)$. The resultant is :- **[AIEEE - 2011]**

(1) A standing wave having nodes at $x = \left(n + \frac{1}{2}\right)\frac{\lambda}{2}, n = 0,1,2$

(2) A wave travelling along + x direction

(3) A wave travelling along –x direction

(4) A standing wave having nodes at $x = \frac{n\lambda}{2}$; n = 0, 1, 2

19. A cylindrical tube, open at both ends, has a fundamental frequency, f, in air. The tube is dipped vertically in water so that half of it is in water. The fundamental frequency of the air-column is now :-

[AIEEE - 2012]

(1) 2f (2) f

(3) f/2 (4) 3f/4

20. A sonometer wire of length 1.5m is made of steel. The tension in it produces an elastic strain of 1%. What is the fundamental frequency of steel if density and elasticity of steel are 7.7×10^3 kg/m^3 and 2.2×10^{11} N/m^2 respectively ? **[JEE(Main) 2013]**

(1) 188.5 Hz (2) 178.2 Hz

(3) 200.5 Hz (4) 770 Hz

21. A pipe of length 85 cm is closed from one end. Find the number of possible natural oscillations of air column in the pipe whose frequencies lie below 1250 Hz. The velocity of sound in air is 340 m/s.

[JEE(Main) 2014]

(1) 6 (2) 4

(3) 12 (4) 8

22. A train is moving on a straight track with speed 20 ms^{-1}. It is blowing its whistle at the frequency of 1000 Hz. The percentage change in the frequency heard by a person standing near the track as the train passes him is (speed of sound = 320 ms^{-1}) close to:- **[JEE(Main) 2015]**

(1) 18% (2) 24%

(3) 6% (4) 12%

23. A uniform string of length 20m 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 :- **[JEE(Main) 2016]**

(take g = 10 ms^{-2})

(1) $\sqrt{2}$ s (2) $2\pi\sqrt{2}$ s

(3) 2s (4) $2\sqrt{2}$ s

24. A pipe open at both ends has a fundamental frequency f in air. The pipe is dipped vertically in water so that half of it is in water. The fundamental frequencty of the air column is now :-

[JEE(Main) 2016]

(1) f (2) $\frac{f}{2}$ (3) $\frac{3f}{4}$ (4) 2f

25. An observer is moving with half the speed of light towards a stationary microwave source emitting waves at frequency 10 GHz. What is the frequency of the microwave measured by the observer? (speed of light = 3×10^8 ms^{-1})

[JEE(Main) 2017]

(1) 17.3 GHz (2) 15.3 GHz

(3) 10.1 GHz (4) 12.1 GHz

26. A granite rod of 60 cm length is clamped at its middle point and is set into longitudinal vibrations. The density of granite is 2.7×10^3 kg/m^3 and its Young's modulus is 9.27×10^{10} Pa. What will be the fundamental frequency of the longitudinal vibrations?

[JEE(Main) 2018]

(1) 2.5 kHz (2) 10 kHz

(3) 7.5 kHz (4) 5 kHz

PREVIOUS YEARS QUESTIONS				ANSWER KEY						Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**3**	**2**	**2**	**2**	**1**	**3**	**3**	**4**	**3**	**4**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**2**	**1**	**1**	**4**	**1**	**4**	**2**	**1**	**2**	**2**
Que.	21	22	23	24	25	26				
Ans.	**1**	**4**	**4**	**1**	**1**	**4**				