WAVES

***General Instructions*:** Answer all the questions. If you are unable to answer any question, go through the page number that is given against that particular question in the text book. You can find the answer**.**

Test Paper-III

MAX MARKS: 30 **TIME: 90Mts**

1	Why liquids and solids have higher speeds of sound than gases?	P371	2
2	A pipe, 30.0cm long, is open at both ends. Which harmonic mode of the pipe resonates a 1.1 kHz source? Will resonance with the same source be observed if one end of the pipe is closed? Take the speed of sound in air as $330ms^{-1}$.	P378	3
3	What are beats? What type of waves produce beats? Give the equation of the waves that produce beats. Give the wave pattern representing beats.	P379 &380	3
4	Two sitar strings A and B playing the note " ***DHA "***are slightly out of tune and produce beats of frequency 5 Hz. The tension of the string B is slightly increased and the beat frequency is found to decrease to 3 Hz. What is the original frequency of B if the frequency of A is 427 Hz?	P380	2
5	What is Doppler effect? Derive the expression for finding the Change in frequency when the observer is stationary, source is moving with a velocity v_s.	P381	3
6	Derive the expression for change in frequency when the observer is moving but the source is stationary.	P382	
7	Derive the expression for apparent change in frequency when both the source and Observer are moving.	P383	3
8	Give the applications of Doppler effect.	P382	2
9	A rocket is moving at a speed of $200ms^{-1}$ towards a stationary target. While moving, it emits a wave of frequency 1000Hz. Some of the sound reaching the target gets reflected back to the rocket as an echo. Calculate (1) the frequency of the sound as detected by the target and (2) the frequency of the echo as detected by the rocket.	P383	3

10 Match the following P384 3

Group-A	Group-B
1. Speed of sound	a. $v = \sqrt{\frac{T}{\mu}}$
2. Speed of a transverse wave	b. $v = \sqrt{\frac{\gamma P}{\rho}}$
3. Speed of a progressive wave	c. $f = \frac{\omega}{2\pi}$
4. Angular frequency of a wave	d. $y(x,t) = -a\sin(kx + \omega t)$
5. Incident wave	e. $y(x,t) = \mathrm{a}\sin(kx - \omega t)$
6. Reflected wave at a rigid boundary	f. $v = \lambda v$

11 Explain how reflection of sound in an open organ pipe such as flute helps in producing standing waves. P380 3

12 Match the following 2

P372 to 381

Group –A	Group-B
a. Beats	1. It is the superposition of two waves of same frequency, same amplitude moving with same speed in the same direction
b. Standing waves	2. Waxing and waning of the intensity of the sound with a frequency equal to the difference in the two close frequencies of two waves
c. Interference	3. Apparent change in frequency of sound due to the relative motion of the observer and source
d. Doppler effect	4. It is due to the superposition of two waves of same frequency, same amplitude moving with same speed in the opposite direction

13 Give the formula to find the vibrating frequencies of (a) a stretched string of length L fixed at both the ends and (b) a pipe of length L with one end closed and other end open P385 1