

April 2014



कण - 099

PHYSICS PAPER - I : PHY - 231
Waves and Oscillations (New)
(23125)

P. Pages : 3

Time : Two Hours

Max. Marks : 40

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks. Figures to the right indicate full marks.
5. Draw neat diagram wherever necessary.
6. Use of logarithmic table or standard electronic calculator is allowed.

1. Attempt **any eight** of the following. Select correct option. 8
- i) Lissajous figures are obtained whenever a particle is subjected to two simple harmonic motions simultaneously.
 - a) along the same straight line.
 - b) at right angles to each other.
 - c) at angle of $\frac{3\pi}{4}$ to each other
 - d) None of the above.
 - ii) SONAR is used for -----
 - a) locating submarines
 - b) receiving a signals in a radio receiver
 - c) locating geostationary satellites.
 - d) None of the above.
 - iii) Damping force is directly proportional to -----
 - a) Displacement
 - b) Velocity
 - c) Acceleration
 - d) Time.

- iv) The sound waves having the frequency above the limit of audibility of the human ear is called -----
- Infrasonics
 - Audible sound
 - Ultrasonics
 - None of the above.
- v) $m \frac{d^2y}{dt^2} + R \frac{dy}{dt} + ky = f \sin qt$ represents differential equation for ----
- Undamped free oscillations
 - Damped free oscillations
 - Forced oscillations
 - None of the above.
- vi) Oscillations of a simple pendulum can be regarded as -----
- Undamped free oscillations
 - Damped free oscillations
 - Forced oscillations
 - Resonant oscillations.
- vii) RADAR is used for ----
- detecting and locating the position of objects such as aeroplanes.
 - receiving a signals in a radio receiver.
 - locating geostationary satellites.
 - None of the above.
- viii) When a source of sound is approaching a stationary listener;
- an apparent rise in frequency of sound is observed
 - an apparent fall in frequency of sound is observed
 - no change in frequency of sound is observed
 - none of the above.
- ix) If an external periodic force is applied on an oscillator then it executes ----
- Undamped free oscillations.
 - Damped free oscillations
 - Forced oscillations
 - none of the above.
- x) The instrument used to measure the depth of sea using ultrasonic waves is -----
- Lactometer
 - Speedometer
 - Galvanometer
 - Fathometer.

2. Attempt **any four** of the following. 8
- State different forces acting on the system if it executes the forced oscillations.
 - Explain Doppler effect in light.
 - Give any two applications of Lissajous figures.
 - Give any four applications of ultrasonic waves.
 - The equation of the critically damped motion is in the form.

$$4 \frac{d^2 y}{dt^2} + R \frac{dy}{dt} + 25y = 0$$
Determine the value of R.
 - Draw a series L-C-R circuit for forced oscillatory system.
3. Attempt **any two** of the following. 8
- Define quality factor of a damped harmonic oscillator. Give its formula. State the factors on which it depends.
 - Derive the condition for velocity resonance and obtain the expression for the maximum velocity amplitude.
 - State general expression for apparent frequency due to Doppler effect in sound. Discuss any three cases.
4. a) Attempt **any two** of the following. 6
- Explain any one method to demonstrate Lissajous figures.
 - What is logarithmic decrement? Obtain an expression of logarithmic decrement.
 - A source emitting a sound note of frequency 900Hz is moving with a velocity of 30m/s towards stationary listener. Determine the apparent rise in frequency. Assume the velocity of sound to be 330m/s.
- b) Give few applications of the Doppler effect. 2
5. Attempt **any one** of the following. 8
- What is meant by Piezo-electric effect? How are ultrasonic waves produced with a Piezo-electric oscillator? Draw necessary circuit diagram.
 - Give an analytical treatment for composition of two S.H.M.'s perpendicular to each other and having their frequencies in the ratio 1 : 2.
 - How do you demonstrate forced and resonant oscillations with Barton's pendulum ?
