April 2015

Seat Number

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खजूर - 017

PHYSICS PAPER - I : PHY - 231
Waves and Oscillations
(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. Graph or diagram should be drawn with the black ink 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 indicates full marks.
5. Draw neat diagram wherever necessary.
6. Use of logarithmic table or electronic calculator is allowed.

1. Attempt **any eight** of the following select correct option. **8**

i) In electrical method, lissajous figures can be obtained by.....
   a) Blackburn's pendulum b) Cathode Ray oscilloscope
   c) Lissajous electrometer d) None of the above

ii) The equation of critically damped motion of an oscillator is of the form $m\frac{d^2x}{dt^2}+8\frac{dx}{dt}+16x=0$. Then the value of m is.....
   a) 1 unit b) 2 units
   c) 4 units d) 8 units

iii) Nuclear magnetic resonance (NMR) is used to study.
   a) Nuclear reactions
   b) Magnetic properties of nuclei
   c) Bombardment of nuclei with high energy particles
   d) None of the above

iv) The velocity of sound can be measured by an equation.
   a) $V=\frac{n}{\lambda}$ b) $V=n\lambda$
   c) $V=\frac{\lambda}{n}$ d) $V=\frac{1}{n\lambda}$

v) The range within which sound is audible is called.....
a) Sonics b) Infrasonics
c) Cultrasonics d) Hypersonics

vi) The resultant amplitude is equal to the sum of the amplitudes of individual S.H.M'S if.
a) $\phi_1 - \phi_2 = \pi$ b) $\phi_1 - \phi_2 = \frac{\pi}{2}$
c) $\phi_1 - \phi_2 = 0$ d) $\phi_1 - \phi_2 = 1$

vii) The equation of motion of damped oscillator is of the form $4\frac{d^2x}{dt^2} + 12\frac{dx}{dt} + 9x = 0$. State whether the motion is .....
a) Damped oscillatory b) Over damped
c) Critically damped d) All of the above

viii) Tan θ is negative and θ is an obtuse angle if .....
a) $q < \omega$ b) $q = \omega$
c) $q > \omega$ d) $q = \frac{1}{\omega}$

ix) When the source and observer are moving in same direction, then apparent frequency is given by.
a) $n' = \frac{V - V_o}{V - V_s}$ b) $n' = \left(\frac{V + V_o}{V - V_s}\right)^n$
c) $n' = \left(\frac{V - V_o}{V + V_o}\right)^n$ d) $n' = \left(\frac{V + V_o}{V + V_s}\right)^n$

x) The quartz crystal set into mechanical liberations produces ultrasonic waves upto frequency of.....
a) 20 Hz b) 20 KHz
c) 50Hz d) 500KHz

2. Attempt **any four** of the following. 8

a) What is piezoelectric effect ?

b) What is Resonance ?

c) What are Lissajous figures ?

d) What do you mean by undamped oscillations ?

e) When a system is said to perform forced oscillations.

f) An observer on the railway platform observed that as a train passed through the station at 90 km/hr, blows a whistle of frequency 400 Hz. Calculate the apparent frequency when train moves towards the observer (velocity of sound in air = 350 m/s).

3. Attempt **any two** of the following. 8

a) Give different methods used in the detection of ultrasonic waves ? Explain Kundt's tube method.

b) Obtain an expression for logarithmic decrement.

c) Explain symmetric nature of Doppler effect in light.

4. a) Attempt **any two** of the following. 6

i) Explain the demonstration of Lissajous figures by using optical method.

ii) Draw the circuit diagram of damped oscillatory series LCR circuit. Write down the differential equation for the same.

iii) Give the applications of Doppler effect.

b) What do you mean by magnetostriction effect. 2

5. Attempt **any one** of the following. 8

a) Set up the differential equation of forced oscillation and discuss its solution.

b) i) In CRO, electrons are deflected by two mutually perpendicular fields such that the displacement at any instant is given by $x = 6 \sin \left(wt + \frac{\pi}{4}\right)$ and $y = 6 \sin wt$.
Find the equation and nature of the resultant path

ii) Draw circuit diagram of magnetostriction oscillator.

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