Seat Number

April-2016

कडबा - 023

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

P. Pages : 4

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 answer. **8**

i) A quartz crystal is commonly used to produce.
   a) Photoelectric effect b) Piezoelectric effect
   c) Doppler effect d) Magnetostriction effect

ii) When the source moves towards a stationery observer, the apparent frequency of the sound.
   a) Decreases b) Increases
   c) Remains same d) None of the above

iii) The velocity resonance occurs when.
   a) Driving frequency $\left(\frac{q}{2\pi}\right)$ is exactly equal to undamped natural frequency $(\omega/2\pi)$.
   b) Driving frequency $\left(\frac{q}{2\pi}\right)$ is less than undamped natural frequency
   c) driving frequency $(q/2\pi)$ is greater than to undamped natural frequency $(\omega/2\pi)$.
   d) None of the above

iv) During the damped oscillations, the Logarithmic decrement is a measure of the
a) Frequency decay b) Velocity decay
c) Amplitude decay d) Energy decay

v) Lissajous figures can be demonstrated by
a) Electrical method b) Optical method
c) Mechanical method d) All of the above

vi) $m\frac{d^2x}{dt^2} + R\frac{dx}{dt} + kx = 0$ represents the differential equation of
a) Undamped harmonic motion
b) Damped harmonic motion
c) Simple harmonic motion
d) None of the above

vii) When a source moves with a velocity 30 m/s towards the stationary observer, the apparent frequency of sound heard by observer is.
a) 250Hz b) 252Hz
c) 240Hz d) 242Hz

viii) Lissajous figures is used for
a) To detect the ultrasonic waves
b) To measure the weight of the tunning fork
c) To determine unknown frequency of the tunning fork
d) None of the above

ix) Up and down motion of the needle of sewing machine is the familiar example of
a) Simple harmonic motion
b) Straight line motion
c) Circular motion
d) All of the above

x) When the source of sound and medium are rest at rest and listener is moving towards the source then the listener receive sound waves which have the apparent frequency n'.
a) $n' < n$ b) $n' > n$
c) $n' = n$ d) $n' \neq n$

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

a) What is piezoelectric effect.

b) Draw curves showing overdamped, critically damped and damped oscillatory motion of an oscillator.

c) Two S.H.M.s are simultaneously acting on particle at right angles given by.
$x = 4\sin(\omega t + \pi/\sigma)$ and $y = 4\sin\omega t$
Find the resultant motion of the particle.

d) Give any four applications of Doppler effect.

e) An alternating emf of peak value 200V is applied in series with a circuit containing a resistance of 10 ohm, an inductance of 20mH and a condenser of capacity $0.5\mu F$. Calculate the resonant frequency.

f) Define the band width of resonance of curve.

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

a) Describe magnetostriction method for the production of ultrasonic waves.

b) Write a short notes on Doppler effect.

c) Show that the average power absorbed by the system is equal to average power dissipated in it, in the steady state of forced oscillations.

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

i) State the equation of motion for a damped oscillator. Obtain the expressions for the amplitude and period of the damped oscillator.

ii) An alternating e.m.f. is applied to a series LCR circuit. Set up the differential equation for electrical oscillations.

iii) Explain the asymmetric nature of Doppler effect.

b) What are ultrasonic waves. 2

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

a) Discuss the composition of two SHMs having the same frequency but different amplitude and phases acting at right angles to each other.

b) i) Describe piezoelectric method for the production of ultrasonic waves.

ii) An oscillator of mass 0.4Kg is hung from a spring whose force constant is 80 N/m. If the damping constant is 20 Ns/m, determine whether the motion is critically damped, overdamped or damped oscillatory.

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