

P. R. Thakur Govt. College
Department of Physics
B.Sc. Semester-II Internal Examination, 2023
Paper - **PHSACOR04T**
Waves and Optics

Time: 1 Hour

Full Marks: 10

1. Answer any *two* questions from the following:

2.5 x 2=5

- (a) Displacement of a particle at an instant t is given by $x(t) = A \cos(\omega t) + B \sin(\omega t)$. Find the amplitude of the motion.
- (b) The amplitude of a particle executing SHM with angular frequency ω is A . Determine the maximum acceleration of the particle.
- (c) Draw the variation of potential energy and kinetic energy of a particle executing SHM with displacement.
- (d) Find the phase difference between velocity and acceleration of a particle executing SHM.

2. Answer any *one* question from the following:

1 x 5=5

- (a) Derive the differential form of equation for a particle executing SHM from energy consideration.
- (b) A particle performs a linear S.H.M along a path 10 cm long. The particle starts from a distance of 1 cm from the mean position towards the positive extremity. Find the epoch and the phase of motion when the displacement is 2.5 cm.

P.R Thakur Govt. College
Second Semester Internal Examination

Subject - Physics

Paper - Core-T4

Time 1 Hour

Full Marks: 20

1. Answer any **five** from the following:

$5 \times 2 = 10$

- (a) Write down the equation of a plane progressive wave propagating in negative x direction and hence obtain its differential form.
- (b) Find the resultant motion of two *S.H.M.* having the same angular frequency ω but differ in phase by 0.5π .
- (c) What happens in the frequency spectrum of a plucked string if it is plucked at its half length position? Give a possible explanation about the result.
- (d) Explain the term 'spontaneous emission' of radiation.
- (e) The coherence time for the red cadmium line ($\lambda = 643.80nm$) is about $10^{-9}s$. Estimate the monochromaticity of the line.
- (f) Is light energy destroyed in the region of destructive interference?
- (g) Why are light waves from two different candles not seen to interfere?
- (h) Show that in case of superposition of waves from two incoherent sources the resultant intensity is the sum of individual intensities.

Department of Physics
P.R. Thakur Govt. College

Answer any **two** from the following:

$5 \times 2 = 10$

2. (a) For gravity waves in a sea the phase velocity c_p is related to the wavelength λ by the relation $c_p = A\sqrt{\lambda}$. Find the group velocity.
- (b) Give short notes on Gravity waves and Water waves. You may use the formula $c_p^2 = \frac{g\lambda}{2\pi} + \frac{2\pi S}{\rho\lambda}$.
- (c) Explain Huygens' principle of wave propagation and deduce from it the laws of refraction of plane waves at plane surface.
- (d) Give the theory of Newton's ring experiment. Show how from their study, the wavelength of monochromatic light can be determined.

Department of Physics
P.R. Thakur Govt. College