

B.Sc. 2nd Semester (Honours) Examination, 2019**PHYSICS****(Waves and Optics)****Paper : 202/C-4****Course ID : 22412****Time: 1 Hour 15 Minutes****Full Marks: 25***The figures in the right hand side margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer *any five* questions: 1×5=5
- Write down Huygens' principle of wave front propagation.
 - What is coherence length and coherence time?
 - The equation of a progressive wave is given by, $y = 0.1 \sin(0.01x - 0.1t)$, where x and y are in m and t is in s . Find the time period of the wave.
 - What is Rayleigh criteria of resolution?
 - Define damping coefficient and find its dimension.
 - State the condition under which transverse vibration of string is affected by tension only and not by rigidify.
 - What is Ghost line in diffraction grating?
 - Write two applications of Fabry-Perot interferometer.
- Answer *any two* questions: 5×2=10
2. (a) What is phase velocity?
- (b) The dispersion relation for microwaves in ionosphere is given by, $\omega^2 = \omega_p^2 + c^2k^2$. Where c is the velocity of light in free space and ω_p is a constant depending upon the electron density of the ionosphere. Show that the phase velocity c_p is greater than c .
- (c) Two vibrations along the same line are described by, $x_1 = 0.03 \cos 10\pi t$ and $x_2 = 0.03 \cos 12\pi t$. Find beat frequency and beat amplitude. 1+2+2=5
3. What is meant by resonance in a mechanical system? Distinguish between amplitude and velocity resonance. Define sharpness of resonance. 1+2+2=5
4. Define interference of light waves. In two beam interference pattern deduce an expression for fringe width. What is the nature of the central fringe in case of Lloyd's mirror experiment? 1+3+1=5
5. Deduce the relationship between resolving power and magnifying power of a telescope. Write some applications of holography. 3+2=5

Answer *any one* question:

10×1=10

6. (a) Find the resultant amplitude and phase due to superposition of N collinear harmonic oscillation with equal phase differences.
- (b) In Young's double slit experiment, the separation between the slits is 1.2 mm and fringe width is 0.5 mm on a screen kept at a distance of 1 m from the slits. Find the wavelength λ of the incident light.
- (c) What do you mean by Ripple waves? 5+3+2=10
7. (a) Find an expression for the intensity at a point due to Fraunhofer diffraction through a plane transmission grating.
- (b) A damped harmonic oscillator has the first amplitude of 20 cm. It reduces to 2 cm after 100 oscillations, each of period 4.6 S. Calculate the logarithmic decrement and damping constant. 7+3=10
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