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B.Sc. (Hons.) Physics (Semester – 2nd)

WAVES AND OPTICS

Subject Code: BPHYS1202

Paper ID: [23131505]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

- a. What is the phase difference between displacement and velocity for a particle executing S.H.M?
- b. What are beats?
- c. Distinguish between longitudinal and transverse waves.
- d. What are the factors affecting the velocity of sound waves?
- e. In Michelson's interferometer 100 fringes cross the field of view when the moveable mirror is displaced through 0.02948 mm. Calculate the wavelength of light used.
- f. What is Huygen's principle?
- g. Why Half-period is called so?
- h. Distinguish between Fraunhofer and Fresnel diffraction.
- i. Using light of wavelength 590 nm, it is found that in a thin film of air 7.4 fringes occur between two points. Deduce the difference of film thickness between these two points.
- j. How much energy is transported by a Standing wave and why?

Section – B

(5 marks each)

- Q2. Calculate the resultant of two simple harmonic vibrations at right angles when their periods are in the ratio 2:1 and there is a phase difference of 0 or $\pi/2$.
- Q3. What are Lissajous figures? How will you trace graphically the Lissajous figures?
- Q4. Define the terms phase velocity and group velocity. Find the relation between them.
- Q5. Derive the expression for fringe-width in case of Young's double slit experiment
- Q6. Find the missing orders in a double slit diffraction pattern?

Section – C

(10 marks each)

- Q7. Discuss analytically the formation of standing wave in a string of fixed length. What are its eigen frequencies? How does the position of nodal point change with eigen frequency?
- Q8. What are Newton's rings? Discuss the formation of Newton's rings by reflected light. How this method is used to determine the refractive index, explain?
- Q9. (a) What is a Zone plate? Drive an expression for its focal length.
(b) Calculate the radii of the first three clear elements of a Zone plate, which is designed to bring parallel beam of light of wavelength 5000 Å to the first focus at a distance of 1.5 metres.