B. Sc. (Hons.) Chemistry (Semester – 4th)
WAVES AND OPTICS
Subject Code: BPHYS1-202
Paper ID: [19131627]

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.   How would you explain the propagation of light on the basis of Huygen's wave theory?
   b. What are Lissajous figures? Describe their applications.
   c. What are the harmonics and overtones?
   d. Distinguish between plane and spherical waves.
   e. Define phase and group velocity.
   f. How the fringes of equal thickness obtained?
   g. Discuss Stokes' treatment of reflection.
   h. A zone plate has multiple foci, explain?
   i. Discuss the formation of Newton's rings. Why the rings are circular in shape?
   j. Why diffraction cannot be observed in our daily life?

Section – B   **(5 marks each)**
Q2. What is the principle and working of Michelson's interferometer, explain in details?
Q3. Derive an expression for fringe width in case of Young's double slit experiment and discuss the consequences of results.
Q4. Discuss the Fraunhofer diffraction pattern at rectangular plate and how it differs from circular plate?
Q5. Discuss the formation of Lissajous figures when two SHMs are having frequencies in the ratio 1:2. Also discuss the various cases when phase difference between two SHMs is $0°$, $90°$ and $180°$.
Q6. i) What are the transverse waves? Derive the wave equation for transverse wave in a string?
   ii) Derive the relation between wave velocity and group velocity.

Section – C   **(10 marks each)**
Q7. Describe the principle, construction, working, theory and action of the zone plates.
Q8. Explain the principle of Fabry Perot interferometer. Obtain an expression for the intensity of transmitted light. Also explain the visibility and sharpness of the fringes obtained in it. Discuss its applications.
Q9. i) What are the transverse waves? Derive the expression for the velocity for transverse vibration of a stretched string.
   ii) Show that two harmonic oscillations, at right angles to each other, of equal amplitudes and equal frequencies but with phase difference of $\pi/2$, are equivalent to a uniform circular motion, the radius of circle being equal to the amplitude of either oscillation.