Roll No. ------------------

**PHY-552**

**Electromagnetic Theory and Spectroscopy**

M.Sc. Physics (MSCPHY)

2nd Year Examination 2024 (Dec.)

**TIME: 2 Hours Max Marks: 70**

**Note: This paper is of Seventy (70) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. *Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.***

**SECTION – A**

**Long-answer - type questions**

**Note: Section ‘A’ contains Five (05) long-answer-type questions of Nineteen (19) marks each. Learners are required to answer any two (02) questions only. (2×19=38)**

1. Define Lienard-Wiechert potentials. Deduce the expression for Lienard-Wiechert potentials due to a charged particle in motion.
2. What do you understand by Zeeman effect? Write down the difference between Normal and Anomalous Zeeman Effect. Compute the Zeeman pattern for 2D3/2 → 2P1/2 transition.
3. Explain Raman effect? Discuss how the change in polarizability leads to appearance of stokes and anti-stokes lines. In what ways does it differ from infrared spectra?
4. Write down the Maxwell’s equations in electrodynamics and their physical significance. Starting from Maxwell’s equations deduce the equation of continuity.
5. State Gauss’s theorem in electrostatics. Apply it to find the electric field strength at a point near an infinite uniform flat sheet of charge.

**SECTION – B**

**Short – answer – type questions**

**Note: Section ‘B’ contains eight (08) short- answer type questions of Eight (08) marks each. *Learners are required to answer any Four (04) questions only.* (4×8=32)**

1. Explain Lande g factor and mention the expression? Evaluate the Lande g factor for an atom in the state 1F3/2 and 2D3/2.
2. State the Franck-Condon principle and briefly explain the three typical situations of intensity distribution in absorption band.
3. Discuss stark effect in weak field and strong field in hydrogen.
4. The first line in the rotational spectra of CO is 3.84 cm–1. Deduce the expression for the moment of inertia and bond length.
5. What is gauge transformation? Define the conditions for Coulomb and Lorentz gauge.
6. Give a brief description of different molecular spectra.
7. State and prove Ampere’s circuital law in magnetostatics.
8. State and prove Poynting vector theorem.