

**P-944**

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## **PHY-552**

### **Electromagnetic Theory and Spectroscopy**

M.Sc. Physics (MSCPHY)

2nd Year Examination, 2023 (June)

**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 answer 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. What do you understand by rotational spectra? Explain spectra of rigid and non rigid rotator.

2. What do you understand by magnetic moment and its physical significance? The ground state of chlorine atom is  $^2P_{3/2}$ . Find its magnetic moment. Into how many sub states this ground state will split in a weak magnetic field.
3. Discuss the Biot-Savart law. Determine the magnetic field due to a straight current carrying filamentary conductor of finite length along Z-axis.
4. Define L-S and J-J coupling with suitable examples in detail. What is the importance of L-S and J-J coupling in atomic spectroscopy?
5. Define Lienard-Wiechert potentials. Deduce the expression for Lienard-Wiechert potentials due to a charged particle in motion.

## 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. Write down the Maxwell's equation in differential form with their explanation. Discuss the idea of displacement current.

2. What do you understand by Zeeman effect? Write down the difference between Normal and Anomalous Zeeman Effect.
  3. Write down the salient features of vibrational rotational spectra.
  4. Explain Amperes circuital law and determine the magnetic field inside solenoid using this law.
  5. Write the expressions for Lorentz and Coulombs gauges. Hence explain the two conditions.
  6. What do you understand by electromagnetic wave? Find the equation for electromagnetic wave propagating in a linear medium.
  7. Briefly discuss Franck-Condon principle.
  8. Compute Lande g-factor for an atom in state  ${}^2D_{5/2}$ .
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