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[Roll No.]

PHY-552

**M.Sc. (Physics) IInd Year
Examination Dec., 2023**

**ELECTROMAGNETIC THEORY
AND SPECTROSCOPY**

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 there in. 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) 2×19=38

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.

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(1)

P.T.O.

1. Write down the Maxwell's equation in electrodynamics. Obtain the expressions of Maxwell's equations in matter. Also discuss Poynting's theorem.
2. What is Lienard-Wiechart potential ? Using Lienard-Wiechart potentials obtain the equations for fields of an accelerated charge.
3. Discuss various quantum numbers used for describing vector atom model. Distinguish between LS and jj-coupling schemes for two value electron system.
4. What is Normal and Anomalous Zeeman effect ? Describe the experimental arrangement for studying the Zeeman Effect. Also discuss the Zeeman Effect for two electron system for the different states of 1D_3 , 1D_2 and 1P_1 .
5. Explain the theory of vibration- rotational spectra of diatomic molecules. Explain the effect of anharmonicity on the vibrational spectra of diatomic molecules.

Section-B

(Short Answer Type Questions) 4×8=32

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.

1. Using Gauss's laws in electro statics obtain Laplace and Poisson's equations. Also obtain the boundary conditions.
2. Obtain an expression for Ampere's law using Biot-Savart law in magneto statistics.
3. Explain the boundary conditions of EM waves and write the parallel and normal component equations of electric and magnetic fields.
4. Write a note on electric quadrupole radiation by using necessary equations and diagrams.
5. Give the outlines for the theory of Paschen-Back effect.
6. Explain the theory of rotational spectra considering the molecule as rigid rotator.
7. What is Born-Oppenheimer approximation ? Mention its role in molecular spectra.
8. Define Frank Condon principle and by using this principle describe intensity distribution of electronic spectral lines.
