A–889

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PHY–552

M.Sc. PHYSICS (MSCPHY)

(Electromagnetic Theory and Spectroscopy)

2nd Year Examination, 2024 (June)

Time : 2:00 Hrs. 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 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.

1. What is Stark effect ? Discuss in detail the weak field stark effect and the strong field stark effect in hydrogen atom ?

2. Distinguish between the L-S and j-j coupling schemes with suitable examples. Calculate the expression for the interaction energy in the case of L-S coupling.

3. Write down the Maxwell's equations in electrodynamics and their physical significance. Starting from Maxwell's equations deduce the equation of continuity.

4. 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.

5. Give a brief description of different molecular spectra. Explain the potential energy behaviour of diatomic molecule.

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. State and prove Ampere's circuital law in magnetostatics.

2. Write an expression for energy of a harmonic oscillator and explain zero point energy.

3. What do you mean by Lande g factor ? Compute the Lande g factor for an atom in the state ^1F and $^2D_{3/2}$.

4. Explain the Larmor Precession.

5. What is gauge transformation ? Define the conditions for Colomb and Lorentz gauge.

6. State the Franck-Condon principle and briefly explain the three typical situations of intensity distribution in absorption band.

7. The first line in the rotational spectra of CO is 3.8423 cm^{-1}. Find the moment of inertia and bond length.

8. What is Normal and Anomalous Zeeman effect ?

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