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Total Pages : 3

Roll No.

MAT-609

Mathematics (MSCMAT/MAMT)

Theory of Relativity

Examination, 2026 (Feb.)

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. Discuss the Michelson-Morley experiment and explain the outcome of this experiment.

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2. Prove that Lorentz transformations form a group.
3. Explain the phenomenon of time dilation in special relativity.
4. Explain the formulation of the energy-momentum vector in special relativity.
5. What are the three types of intervals in Minkowski space, based on the sign of s^2 ?

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. Prove that Newtonian fundamental equations are invariant under Galilean transformation.
2. The length of a rocket ship is 100 meters on the ground. When it is in flight, its length observed on the ground is 99 meters. Calculate its speed.
3. How much electric energy could theoretically be obtained by annihilation of 1 gm of matter?
4. What is the significance of Minkowski space in general relativity?
5. Discuss the concept of simultaneity in special theory.

6. What is meant by the term dummy suffix in tensor notation? Explain its role in tensor equations and how it relates to the summation convention.
7. If a_{ij} is a symmetric covariant tensor, then the conjugate tensor a^{ij} is also a tensor.
8. Write a short note on Bianchi Identity.
