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SUBJECT CODE NO: -B-2093
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. Pattern - 2013 (S.Y SEM III)
Examination November / December 2025
Physics -VII Mathematical Statistical Physics and Relativity

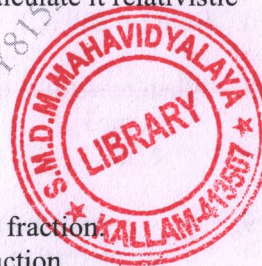
[Time: 1:30 Hours]**[Max. Marks: 50]**

Please check whether you have got the right question paper.

N. B

- 1) Attempt all questions.
- 2) Use of logarithmic table and electronic pocket calculator is allowed.

- Q1 a) Explain second order differential equation with constant co-efficient of :- **10**
 a) real and unequal roots
 b) real and equal roots
 b) Obtain an expression for Maxwell -Boltzmann energy distribution law **10**
OR
 a) Derive an expression for Plank's radiation law of a black body. **10**
 b) Obtain Galilean Transformation equations and prove the invariance of acceleration under Galilean Transformation. **10**
- Q2 a) If $F(x, y) = 3yx^2 + 2x^2y^3$ then find the values of f_{xx} , F_{xy} , f_{yx} , F_{yy} . **05**
 b) Write short note on permutation and combination **05**
 c) Calculate the number of ways of arranging 8 Fermions in 12 Phase space cells **05**
 d) Write a short note on length contraction. **05**
OR
 a) Write a short note on total differentiation. **05**
 b) Three coins are tossed simultaneously Find the probability of getting one head and two tail. **05**
 c) Differentiate between classical & quantum statistics. **05**
 d) A particle of rest mass m_0 is moving with velocity $0.9c$; calculate its relativistic mass. **05**
- Q3 Multiple choice questions **10**
1. The degree of differential equation is the degree of
 - a. Highest derivative without removing the radical sign and fraction
 - b. Highest derivative after removing the radical sign and fraction
 - c. Lowest derivative without removing the radical sign and fraction.
 - d. Lowest derivative after removing the radical sign and fraction.



2. A differential equation involving derivatives with respect to a single independent variable is called:
 - a. Ordinary differential equation.
 - b. Partial differential equation.
 - c. Linear differential equation.
 - d. None of these
3. The principle of assuming equal probability for events which are likely to occur is known as the principle of
 - a. Equality of probability.
 - b. Equity of probability
 - c. Equal a priori probability
 - d. None of the above
4. Particles obeying Maxwell- Boltzmann statistics are _____ and have _____
 - a. Distinguishable, Zero spin
 - b. Distinguishable, Odd spin
 - c. Indistinguishable, Zero spin
 - d. Distinguishable, Even spin.
5. Photon gas obeys which statistics?
 - a. Fermi- Dirac:
 - b. Bose-Einstein
 - c. Maxwell - Boltzmann
 - d. None of the above.
6. At higher temperature Fermi-Dirac distribution approaches:
 - a. Maxwell - Boltzmann distribution.
 - b. Bose-Einstein distribution.
 - c. Both (a) and (b)
 - d. None of the above.
7. An inertial frame of reference is that frame in which:
 - a. Law of inertia is valid
 - b. Does not move with constant velocity.
 - c. First law of motion is valid
 - d. Both (a) and (C).
8. When mass m is converted into it release energy equal to
 - a. mc^3
 - b. mc^2
 - c. m^2c
 - d. mc
9. _____ includes meaningful as meaningless arrangement
 - a. microstate
 - b. Combination
 - c. Permutation
 - d. Macrostate
10. According to Einstein, which of the following is considered as the 4th dimension?
 - a. Energy
 - b. Space
 - c. Time
 - d. Momentum

