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SUBJECT CODE NO: - Y-2021
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. S.Y (Sem-III)
Examination March / April - 2023
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 & electronic Pocket calculator is allowed.

Q1   a) What is Partial differentiation? Discuss its geometrical interpretation.   10

      b) Evaluate constants α and β using Maxwell - Boltzmann statistics.   10

OR

      a) Deduce plank's black body radiation formula   10

      b) Derive the mass-energy equivalence relation of Einstein.   10

Q2   a) Write a note on total differentiation   5

      b) We throw a die twice and obtain two numbers. What is the probability that these   5
          numbers are 6 & 4 precisely in that order?

      c) Three particles are to be distributed in four energy levels a, b, c and d. write down   5
          all the possible ways of this distribution when particles are classical particles,
          Bosons, fermions.

      d) Write a short note on length contraction.   5

OR

      a) If $F = e^{-xy}, x = rcos\theta$ & $y = rsin\theta$ Find $\frac{\partial F}{\partial r}$ by chain rule.   5

      b) Write a short note on permutation and combinations.   5

      c) What is difference between classical and quantum statistics.   5

      d) The rest energy of proton is 930 MeV. Calculate the relativistic Kinetic energy of
          a proton moving with a speed of 0-5c.   5

Q3   Multiple choice questions   10

1) The order of given differential equation $\frac{dy}{dx} + 2y = 0$ is

   a) 2   b) 1   c) 3   d) 4

2) The quantity df = Fxdx + Fydy is called as

   a) An exact differential off   b) Implicit function of F

   c) Explicit function of F   d) Total differential of F

3) Statistical methods give greater accuracy when number of observations is

   a) Very small   b) very large

   c) Neither very small or very large   d) None of these

4) Five particles are distributed in two phase cells. Then number of macrostates is

   a) 6   b) 10   c) 32   d) 5/2

5) Bosons obey Pauli's exclusion principle

   a) True   b) False   c) Can't say   d) Sometimes true or sometimes false

6) The spin of Photon is

   a) $\frac{1}{2}h$ b) $\frac{3}{2}h$ c) zero   d) $\hbar$

7) The formation of groups is called as

   a) Permutation   b) combination   c) Probability   d) Frequency

8) The length contraction becomes appreciable only when

   a) V= C   b V $\approx$ c   c) V $\neq$ c   d) V > c

9) A particular task requires 3.46J energy. Using $E=mc^2$, how much Mass is needed
   to accomplish this task?

   a) 3.84×10^{-17} kg   b) 3.46×10^{-16} kg

   c) 3.11×10^{17} kg   d) 1.15×10^{-8} kg

10) According to Galilean transformation t' and t is

   a) Equal   b) Not equal   c) Approximately equal   d) None of these