Total No. of Printed Pages: 3

SUBJECT CODE NO:- 2021
FACULTY OF SCIENCE & TECHNOLOGY
B.Sc. S.Y Sem-III
Examination March/April-2022 (To be held in June/July-2022)
Physics -VII
Mathematical Statistical Physics and Relativity

[Time: 1:53 Hours] **[Max. Marks:50]**

Please check whether you have got the right question paper.

N.B.
     i)   Attempt all Questions.
     ii) Use of logarithmic table & electronic pocket.

Q.1
     (a) Explain the first order differential equation and its solution.   10
     (b) Derive Maxwell – Boltzmann energy distribution law for an ideal gas.   10

OR

     (a) Derive an expression for Fermi-Dirac distribution law in quantum statistics.   10
     (b) Explain using Lorentz transformation equation, variation of mass with velocity.   10

Q.2
     (a) Write a note on Successive differential equation.   05
     (b) If $dF = (y^2 + y + 4xy)dx + (2x^2 + x + 2xy)dy$ then check whether dF is an exact differential.   05
     (c) Write a note on Fermi level and Fermi energy.   05
     (d) A System consists of 5 particles arranged in two compartments with first compartment is divided into 4 cells and second in 6 cells. Calculate thermodynamic probability of Macro state (2, 3) if particles obey Fermi-Dirac statistics.   05

OR

     (a) Discuss Macro state and Micro state.   05
     (b) Calculate the probability that in tossing a coin 5 times, 3 heads and 2 tails are obtained.   05
     (c) State and discuss postulates of special theory of relativity.   05
     (d) At what speed will mass of the body be 1.25 times its rest mass.   05

Q.3   Multiple Choice Questions.   10

(1) If $F = 3y^2x + 4x^2y$ then F_{yy} is _____.
(a) 6x
(b) 6y
(c) 6xy
(d) xy

(2) Degree of differential equation is _____.
(a) Highest derivative in the equation.
(b) Lowest derivative in the equation.

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(c) Exponent power of highest derivative

(d) Exponent power of lowest derivative

(3) A phase space has _____.

(a) Three momentum coordinates

(b) Three position coordinates

(c) Three position and three momentum coordinates

(d) Six position and six momentum coordinates

(4) Probability of occurrence of two independent events is equal to their _____.

(a) Sum

(b) Ratio

(c) Difference

(d) Product

(5) Thermodynamic probability of the Macro state (1, 3) is _____.

(a) 01

(b) 02

(c) 04

(d) 06

(6) Particles obeying Bose – Einstein Statistics are _____.

(a) Identical, indistinguishable without any spin

(b) Identical, distinguishable without any spin

(c) Identical, indistinguishable with integral spin

(d) Identical, distinguishable with integral spin

(7) Which of the following particle is not a fermion _____.

(a) π – meson

(b) electron

(c) proton

(d) α – particle

(8) Michelson – Marley experiment proves _____.

(a) Speed of light is changing

(b) Existence of ether medium

(c) Speed of light is controlled

(d) Non – existence of ether medium

(9) Mass – energy equivalence relation is _____.

(a) $E = m^2c$

(b) $E = m^2c^2$

(c) $E = mc^2$

(d) $E = m^2c^4$

(10) If a body of rest mass 10 kg is moving with a velocity of 0.6 times velocity of light then

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its mass in motion is _____.

(a) 10.5 Kg
(b) 12.5 Kg
(c) 10 Kg
(d) 12 Kg