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**SUBJECT CODE NO:- B-2015**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. S.Y. (Sem-III) Examination Oct/Nov 2019**  
**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
- Q.1
- a) Obtain the solution of Homogenous second order linear differential equations with constant coefficients. 10
  - b) Write the conditions of fermions Derive Fermi- Dirac distribution law. 10
- OR
- a) Define probability and frequency Explain the basic additive law of probability. 10
  - b) Explain construction and working of Michelson's interferometer 10
- Q.2
- a) Distinguish between F.D and B.E statistics. 05
  - b) Discuss the exact differentiation of function. 05
  - c) Ten particles are distributed in 2 cells find the possible number of macrostates and corresponding number of microstates. 05
  - d) If 4 kg of mass is converted fully into energy. find the amount of energy generated. 05
- OR
- a) If  $y = A \sin wt + B \cos wt$  show that  $\frac{d^2y}{dt^2} = -w^2y$  05
  - b) Find the number of ways in which four bosons may be the distributed in the five cells. 05
  - c) What is thermodynamic probability 05
  - d) Obtain Einstein's energy mass relation. 05
- Q.3 Attempt all 10
- 1) The degree of the given differential equation is  $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + xy = 0$ 
    - a) 1      b) 3      c) 2      d) 4
  - 2) The quantity  $dF = Fx dx + Fy dy + f_2 d_2$  is known as
    - a) Implicit function      b) An exact differential of F
    - c) Total differential of F      d) Explicit functional of F
  - 3) All fundamental particles with spin ----- are fermions.
    - a) 2      b) -1      c)  $\frac{1}{2}$       d)  $-\frac{1}{2}$

- 4) How many ways two particles can be arranged in three cells according to M.B statistics  
 a) 9                      b) 6                      c) 4                      d) 27
- 5) RMS velocity of an ideal gas is inversely proportional to the square root of  
 a) Mass                      b) temperature                      c) None of these                      d) both of a and b
- 6) The value of probability of an event cannot be  
 a) Zero                      b) negative                      c)  $\frac{1}{2}$                       d) 1
- 7) The M.B distribution law in general can be expressed as ,  
 a)  $ni = gi e^{-\alpha} e^{-Ei\beta}$                       b)  $ni = \frac{gi}{e^{-\alpha} e^{-\beta Ei}}$                       c)  $ni = \frac{gie^{-\alpha}}{e^{-\beta Ei}}$                       d)  $ni = \frac{gie^{-\beta Ei}}{e^{-\alpha}}$
- 8) The negative results of Michelson Morley experiment concluded that the velocity of light is  
 a) Variant                      b) can't say                      c) constant                      d) none of these
- 9) The length determined by an observer at rest with respect to the object is called  
 a) Proper length                      b) rest length                      c) length contraction                      d) length elongation
- 10) Particle with a proper lifetime is  $1\mu s$  moves through the laboratory at  $2.7 \times 10^8 m/s$  .  
 the lifetime of particle as measured by observer in laboratory is -----  
 a)  $2.3 \times 10^6 sec$                       b)  $4.6 \times 10^6 sec$                       c)  $2.3 \times 10^{-6} sec$                       d)  $4.6 \times 10^{-6} sec$