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Y—172—2019

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

PHYSICS

Paper-VII

(Statistical Physics, Electromagnetic Theory and Relativity)

(MCQ & Theory)

(Saturday, 23-11-2019) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Q. No. **1** is MCQ type, answer MCQ on OMR sheet only.

(*iii*) Question Nos. **2**, **3** and **4** are descriptive type questions.

(*iv*) Use separate answer book/sheet for M.C.Q. type questions and descriptive type questions.

(*v*) Allow log-table for calculations.

(*vi*) Negative marking system is applicable for MCQs.

MCQs

1. Attempt all multiple choice questions : 10

(*i*) The value of permutations $5p_3$ = ...

(*a*) 24 (*b*) 48

(*c*) 60 (*d*) 64

(*ii*) The Boltzmann's relation between entropy and thermodynamics probability is.....

(*a*) S = log w max (*b*) S = k log w max

(*c*) S = k^2 log w max (*d*) S = k log w^2 max

P.T.O.

(*iii*) The M.B. distribution law is given by :

(*a*) $n_i = gi\, e^{-\alpha}\, e^{-\beta \mathrm{E}i}$ (*b*) $n_i = gi\, e^{-\alpha}\, e^{\beta \mathrm{E}i}$

(*c*) $n_i = \frac{e^{-\alpha}.e^{-\beta \mathrm{E}i}}{gi}$ (*d*) $n_i = gi\, e^{-\alpha}.e^{-\beta/\mathrm{E}i}$

(*iv*) Each cell in phase space has volume equal to.....

(*a*) $3h^3$ (*b*) $h^3/3$

(*c*) h^3 (*d*) $2h^3$

(*v*) According to stirling approximations log *x*! = ...

(*a*) log *x* (*b*) log *x* – *x*

(*c*) *x* log *x* (*d*) *x* log *x* – *x*

(*vi*) The Gauss theorem in presence of dielectric medium can be written as.....

(*a*) $\oint_s \vec{\mathrm{E}}.ds = \frac{q}{k \in_o}$ (*b*) $\oint_s \vec{\mathrm{E}}.ds = -\frac{q}{k \in_o}$

(*c*) $\vec{\nabla}.\vec{\mathrm{B}} = 0$ (*d*) $\vec{\nabla} \times \vec{\mathrm{E}} = -\partial \mathrm{B}/\partial t$

(*vii*) $\vec{\nabla} \times \vec{\mathrm{E}} = -\partial \mathrm{B}/\partial t$ this equation represents :

(*a*) Gauss's law (*b*) Ampere's law

(*c*) Faraday law (*d*) Coulomb's law

(*viii*) Lorentz Transformation equations reduces to Galilean Transformation when :

(*a*) V > C (*b*) V < < C

(*c*) V = C (*d*) V = 2C

(*ix*) The formula for Lorentz–Fitzgerald contraction is.....

(*a*) $L = \dfrac{Lo}{\sqrt{\frac{1-v^2}{c^2}}}$ (*b*) $L = Lo\sqrt{\frac{1-v^2}{c^2}}$

(*c*) $L = \dfrac{Lo}{\sqrt{\frac{1+v^2}{c^2}}}$ (*d*) $Lo = L\sqrt{\frac{1-v^2}{c^2}}$

(*x*) If 7 kg of substance totally converted into energy, then energy is produced :

(*a*) 6.3×10^{16} J (*b*) 63×10^{16} J

(*c*) 630×10^{16} J (*d*) 0.63×10^{16} J

Theory

2. Attempt any *five* of the following questions : 10

(*i*) Define Thermodynamic probability.

(*ii*) Define phase space.

(*iii*) Define Ampere's law.

(*iv*) State postulates of special theory of Relativity.

(*v*) Define Electron Gas.

(*vi*) Define Poynting vector.

(*vii*) State Mass-Energy Relation.

3. Attempt any *two* of the following questions : 10

(*i*) Explain permutation and combinations.

(*ii*) Write a note on B–E distribution.

P.T.O.

(*iii*) Derive Maxwell's equation :

(1) $\nabla \times \mathrm{B} = \mu_o \left[\mathrm{J} + \in_o \frac{\partial \mathrm{E}}{\partial t} \right]$

(2) $\nabla \times \mathrm{E} = -\partial \mathrm{B} / \partial t$

(*iv*) Explain time dilation theory in Relativity.

4. Attempt any *one* of the following questions : 10

(*i*) Derive an expression for Fermi-Dirac distribution law.

(*ii*) Derive an expression for Lorentz Transformations.