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BF—117—2016

FACULTY OF SCIENCE

B.Sc. (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2016

PHYSICS

Paper VII

(Statistical Physics, Electromagnetic Theory and Relativity)

(MCQ & Theory)

(Saturday, 10-12-2016)   **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 Hours   *Maximum Marks—40*

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

      (*ii*)   Question No. **1** is MCQ type. Answer MCQs on OMR sheet only.

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

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

      (*v*)   Negative marking system is applicable to MCQ examination.

(MCQ)

1.   Attempt *all* multiple choice questions :   10

   (*i*)   The thermodynamic probability is :

      (*a*)   Number of microstates in a given macrostate

      (*b*)   Number of macrostates in a given microstate

      (*c*)   Number of microstates in a given microstate

      (*d*)   Number of macrostates in a given macrostate

   (*ii*)   The value of combinations $^6C_3$ is :

      (*a*)   18   (*b*)   9

      (*c*)   20   (*d*)   10

P.T.O.

(iii) The particles obeying Pauli's exclusion principle in the following distribution law :

(a) Maxwell-Boltzman (b) Fermi-Dirac

(c) Bose-Einstein (d) All of these

(iv) The phase space volume in Fermi-Dirac and Bose-Einstein statistics is V =

(a) h (b) h^2

(c) h^4 (d) h^3

(v) Fermi-Dirac statistics is applicable to :

(a) Photon gas (b) Electron gas

(c) Boson gas (d) Neutron gas

(vi) Maxwell-Boltzmann statistics maximum probability distribution is given by :

(a) $\dfrac{1}{e^{\left(\alpha + \beta \epsilon_i\right)}}$ (b) $\dfrac{1}{e^{\left(\alpha - \beta \epsilon_i\right)}}$

(c) $\dfrac{1}{e^{\left(\alpha^2 + \beta \epsilon_i\right)}}$ (d) $e^{\left(\alpha - \beta \epsilon_i\right)}$

(vii) Ampere-Maxwell law shows that a changing electric field give rise to :

(a) Electric field (b) Gravitational field

(c) Magnetic field (d) Heat

(viii) The Maxwell equation $\nabla \times E = \dfrac{-\partial B}{\partial t}$ is called as differential form of a .... of electromagnetic induction.

(a) Ampere's law (b) Oersted law

(c) Lenz's law (d) Farady's law

(ix) According to Einstein's special theory of relativity velocity of .... in free space is constant.

(a) Proton (b) Light

(c) Electron (d) Neutron

(x) The time dilation takes place by a factor :

(a) $1\big/\sqrt{1 + v^2\big/c^2}$ (b) $1\big/\sqrt{1 - v^2\big/c^2}$

(c) $\sqrt{1 - v^2\big/c^2}$ (d) $\sqrt{1 + v^2\big/c^2}$

(Theory)

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

(i) Define the term Entropy.

(ii) Define the probability in term of frequency.

(iii) Write the equation for maximum probability distribution in Bose-Einstein.

(iv) What is Photon gas ?

(v) State Poynting vector.

(vi) Write any *two* Maxwell's equations.

(vii) Define frame of reference.

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

(i) Explain thermodynamic probability.

(ii) Write a note on Maxwell-Boltzmann statistics.

(iii) State and explain Ampere's law.

(iv) Write a note on length contraction.

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

(i) Derive Maxwell's equations.

(ii) Derive an expression for mass-energy relation.