RAN-1148

T.Y.B.Sc. (Semester - VI) Examination

March / April - 2019

Physics Paper-VII

Electromagnetism and Optics

[Total Marks: 50

સૂચના : / Instructions

Instruction:

(1) Figures on the right indicate the total marks carried by the question.
(2) Symbols used in the question paper have their usual meanings.
(3) Students are permitted to use non-programmable scientific calculator

Q:1   **Answer the following in brief (Any eight).**   **(8)**

  (1) On which factors does the value of magnetic susceptibility of a substance depend?
  (2) What is the unit and dimensional formula of magnetic moment?
  (3) What is a domain in a ferromagnetic substance?
  (4) Define: Energy density.
  (5) How is any vector field completely characterized?
  (6) Distinguish between steady current and non-steady current?
  (7) Define: Coherence time.
  (8) What is meant by metastable state?
  (9) Name the components required to generate LASER.
 (10) Explain in brief the word the letter "A" represents in LASER.

Q:2 (A) Attempt any ONE of the following. (10)
  (1) Derive an ,expression for the resultant magnetic induction in the presence of a magnetic material as
$B = \mu_0 H + \mu_0 M$.
  (2) Considering an example of an RC circuit, discuss how the concept of displacement current was introduced by Maxwell.

(B) Attempt any ONE of the following. (4)
  (1) The magnetic moment per atom of iron is 2.22 μ_B.
Calculate its magnetization by assuming perfect alignment of all of its magnetic moments. The density of iron is 7.9 X 10^3 $\dfrac{kg}{m^3}$. Atomic mass of iron is 56.
$N_A = 6.023 \times 10^{23}$ mol^{-1}.
  (2) Show that the dimensions of $\dfrac{1}{\sqrt{\varepsilon_0 \mu_0}}$ are same as those of speed.

Q:3 (A) Attempt any ONE of the following. (10)
  (1) Discuss the interactions between an atom and an electromagnetic radiation.
  (2) Explain construction and working of He-Ne LASER.

(B) Attempt any ONE of the following. (4)
  (1) Calculate mean spontaneous life time of the upper level for 2P → 1S transition in an element, given that A = 6 x 10^8 s^{-1}.
  (2) A distant star has an angular diameter of 10^{-7} rad and it emits light of average wavelength 5000 Å. Calculate the minimum distance between pinholes for which fringes will disappear in Michelson stellar interferometer.

Q:4 Write short note on any TWO of the following. (14)
  (i) Bohr magneton
 (ii) Properties of electromagnetic waves
 (iii) Applications of LASER
 (iv) Components required to generate LASER
 (v) Temporal coherence

————