

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 3

P347

[5215]-4

F.Y.B.Sc.

PHYSICS-II

Physics Principles and Applications and Electromagnetics

(2013 Pattern) (New Course) (Paper-II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logtables and calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt ALL of the following:

[16]

- a) What do you mean by pumping in lasers?
- b) Define ionic bond. Give examples.
- c) State Bohr's postulates.
- d) Calculate the energy of photon of yellow light with frequency of 5.25×10^{14} Hz, in both, joule and electron volt.
- e) What do you mean by electric polarization.
- f) Explain in brief paramagnetism.
- g) State importance of Ampere's circuital law.
- h) A conductor having a charge density $120 \mu\text{C}/\text{m}^2$ kept in air. Find the magnitude of electric intensity at a point near the conductor.

Q2) Attempt any four of the following:

[16]

- a) Explain the basic arrangement of Radar. State its applications.
- b) Explain in detail population inversion process in lasers.
- c) Explain construction and working of solar cell.
- d) The force constant of vibration in oxygen (O_2) molecule is 1180 N/m . The mass of oxygen atom is $2.66 \times 10^{-26} \text{ kg}$. Find the energy separation between adjacent vibrational levels of molecule in joule and electron volt.

P.T.O.

- e) Find the wave number of second line of Paschen series. (Given: $R = 1.097 \times 10^7 \text{ m}^{-1}$)
- f) A microwave radiation has frequency of 14 GHz. What would be the wavelength and energy of photon corresponding to this radiation. (Given: $h = 6.626 \times 10^{-34} \text{ Js}$)

Q3) Attempt any four of the following:

[16]

- a) Using Biot-Savart's law, obtain an expression for magnetic field produced in long straight conductor.
- b) Distinguish between diamagnetic and ferromagnetic material.
- c) Using Gauss's theorem, obtain an expression for electric intensity at a point due to uniformly charged non-conducting sphere.
- d) Calculate the electric field due to dipole of dipole moment $2 \times 10^{-10} \text{ C-m}$ at a distance of 1 m from it on its axis. (Given: $P = 2 \times 10^{-10} \text{ C-m}$, $r = 1 \text{ m}$)
- e) A bar magnet made of iron has magnetic moment 4.0 A/m^2 and mass $5 \times 10^{-3} \text{ kg}$. If the density of iron is $6 \times 10^3 \text{ kg/m}^3$, find the intensity of magnetization.
- f) A solenoid of 500 turns/m is carrying current 3A. If the core is made of iron which has a relative permeability of 5000, determine the magnitude of magnetic intensity and magnetization.

Q4) Attempt any two of the following:

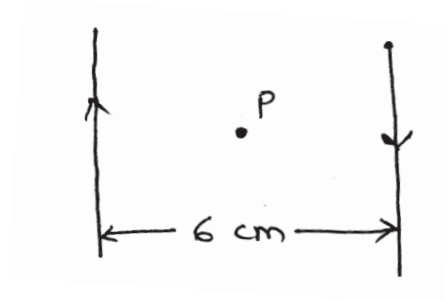
[16]

- a) Explain the various sources of electromagnetic waves.
- b)
 - i) Explain induced absorption and spontaneous emission in detail.
 - ii) CO molecule absorbs infrared radiations of frequency $6.42 \times 10^{13} \text{ Hz}$. What is the force constant of the bond in CO molecule and what is the spacing between the vibrational energy levels. (Given: $\mu = 1.14 \cdot 10^{-26} \text{ kg}$)
- c)
 - i) What do you mean by covalent bond? Explain the properties of covalent compounds.
 - ii) The first line of Balmer series of hydrogen atom has wavelength of 6563 \AA . Calculate the wavelength of second line of Balmer series.

Q5) Attempt any Two of the following:

[16]

- a) What is electric dipole? Obtain an expression for electric potential at any point due to an electric dipole.
- b)
 - i) Explain the concept of electric field.
 - ii) The following figure shows two long straight wires carrying electric current 10 A in opposite directions. The separation between the wires is 6 cm. Find magnetic field at point P midway between the wires.



- c)
 - i) Explain the terms
 - 1) magnetic induction (\vec{B}) and
 - 2) magnetic intensity (\vec{H}).
 - ii) Calculate the force between two balls each having charge of $12 \mu\text{C}$ and are 8 cm apart.

