**Total No. of Questions :5]**

**SEAT No. :** ____

**P501**

**[Total No. of Pages :3**

# [4917]-104
# F.Y.B.Sc.
# PHYSICS
## 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 calculators is allowed.***
4 ***Neat diagram must be drawn wherever necessary.***

***Q1)*** Attempt ALL of the following: **[16]**

a) State Biot Savart's law.

b) Define terms - electric dipole and dipole moment.

c) Give relation between $\vec{B}, \vec{M}$ & $\vec{H}$ .

d) Explain Polar and Non-Polar molecules.

e) What do you meant by stimulated emission?

f) What do you mean by photon?

g) Give the equation of wavelength in Paschen series of hydrogen atom.

h) Calculate the electric field intensity due to a point charge $2 \times 10^{-10}$ C at a distance of 1 m away from it [Given - $\epsilon_0 = 8.85 \times 10^{-12} \, C^2/N\text{-}m^2$ ]

***Q2)*** Attempt any FOUR of the following: **[16]**

a) Explain Laser action using three level energy system.

b) Explain the working of solar cell with schematic diagram.

***P.T.O.***

c) What is meant by covalent bonding? Give properties of covalent crystals.

d) The input power of solar cell is 1.25W and it has $I_{SC}$ = 300 mA, $V_{OC}$ = 0.5V and FF = 0.6. Calculate the efficiency of solar cell.

e) A microwave radiation has a frequency of 12GHz. What would be the energy of the photon corresponding to this radiation?
[Given - h = $6.626 \times 10^{-34}$ Js]

f) Find the wave number of second line of the Paschen series
[Given - R = $1.097 \times 10^{7}$ $m^{-1}$]

***Q3)*** Attempt any FOUR of the following: **[16]**

a) Obtain an expression for torque on a dipole placed in an uniform electric field.

b) Distinguish between paramagnetic and ferromagnetic materials.

c) State and prove Gauss's Law in dielectrics.

d) A solenoid of 300 turns/m is carrying a current of 4 Amp. If the core is made of iron, which has a relative permeability of 5000, determine the magnetic intensity H, magnetization M and magnetic induction B inside the core. [Given - $\mu_0 = 4\pi \times 10^7$ Wb / A - m]

e) Calculate the force between two balls each having a charge of 16μC and are 10 cm a part. (Given - $\epsilon_0 = 8.85 \times 10^{-12}$ $C^2/N\text{-}m^2$ ]

f) The electric field intensity at a point at a distance of 1m from the centre of a charged sphere of radius 30 cm is $10^4$ N/C. Find surface charge density on the surface of sphere. The sphere is placed in air.

[Given- $\epsilon_0 = 8.85 \times 10^{-12}$ $C^2/N\text{-}m^2$ ]

***Q4)*** Attempt any TWO of the following: **[16]**

a) What is X-ray radiography? State its applications.

b) i) Give physical properties of ionic compounds.

ii) The series limit wavelength for Balmer series of hydrogen spectrum is 3645 $A^o$. Calculate the value of Rydberg constant.

c) i) Explain Rutherfords atomic model and give its limitations.

ii) The lowest vibrational states of the NaCl molecule are 0.063 eV apart. Find approximate force constant of this molecule.

[Given - Mass of Na = $3.82 \times 10^{-26}$ kg

Mass of Cl = $5.81 \times 10^{-26}$ kg]

***Q5)*** Attempt any TWO of the following: **[16]**

a) Obtain an expression for electric field intensity on the axis of charged disc.

b) i) Define electric polarization vector. Obtain an expression for polarization vector in homogeneous isotropic dielectric.

ii) An aluminium wire of diameter 0.3 cm carries a current of 15 amp. Find the magnetic field on the surface of the wire.

[Give - $\mu_0 = 4\pi \times 10^7$ Wb / A - m ]

c) i) Obtain an expression for $\vec{B}$ on the axis of a current carrying circular loop.

ii) A bar magnet made of iron has magnetic moment 3.0 A-$m^2$ and mass $3 \times 10^{-3}$ kg. If the density of iron is $6 \times 10^{-3}$ kg/$m^3$, find the intensity of magnetization.

*EEE*