

F.Y.B.SC. SEM – II (CBCS - 2016 COURSE) : SUMMER - 2018

SUBJECT: PHYSICS: ELECTRICITY & MAGNETISM

Day: Wednesday
Date: 18/04/2018

Time: 03.00 PM TO 06.00 PM
Max. Marks: 60

S-2018-0636

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Neat diagrams must be drawn **WHEREVER** necessary.
- 4) Use of **logarithmic table / calculator** is allowed.
- 5) All the symbols have their usual meaning unless otherwise stated.

Q.1 A) Select and write the most appropriate answer from the given alternatives for (06) each sub question.

- a) S.I. unit of linear charge density is _____.
i) C-m
ii) C/m²
iii) C/m
iv) C-m²
- b) Dielectric constant for air is _____.
i) K = 1
ii) K < 1
iii) K > 1
iv) K = 0
- c) Iron, nickel, cobalt and their alloys are examples of _____ substance.
i) diamagnetic substance
ii) Paramagnetic substance
iii) ferromagnetic substance
iv) none
- d) Electric potential at any point on the perpendicular bisector of the dipole is _____.
i) $V = \frac{1}{4\pi\epsilon_0} \frac{p}{r^2}$
ii) Zero
iii) $V = \frac{1}{2\pi\epsilon_0} \frac{p}{r^2}$
iv) $V = \frac{1}{4\pi\epsilon_0} \frac{p}{r^3}$
- e) The line integral of magnetic field around any closed path is equal to μ_0 times the total current passing through that closed path is
i) Gauss's law
ii) Coulomb's law
iii) Biot- Savart's law
iv) Ampere's law
- f) Force acting on a charge of $20 \mu C$ in electric field is 0.05N, electric field intensity at that point is _____.
i) $2.5 \times 10^3 N/C$
ii) $25 \times 10^3 N/C$
iii) $0.25 \times 10^3 N/C$
iv) $2.5 \times 10^{-2} N/C$

B) Attempt all the following:

(06)

- a) State Coulomb's law in electrostatics.
- b) Define electric dipole moment. State its SI unit.
- c) What is dielectric constant? State its value for air.
- d) Give the physical significance of equation of torque on dipole placed in an electric field.
- e) State characteristics of ferromagnetic substance.
- f) State the use of Solenoid.

P. T. O.

Q.2 Attempt any **THREE** of the following: (12)

- a) State Gauss's law. Obtain an expression for electric intensity at a point due to uniformly charged non-conducting sphere.
- b) Obtain an expression for torque acting on dipole placed in an uniform electric field. Express it in vector form.
- c) State Ampere's law. Obtain an expression for magnetic induction at a point due to straight conductor carrying current.
- d) An ideal solenoid of aluminum core have 40 per cm and a current 2.5 A. Calculate magnetization in developed in the core of substance.

Q.3 Attempt any **FOUR** of the following: (12)

- a) State expression for electric intensity at a point at a distance 'd' from charge wire of length 2L. Hence determine
 - a) Electric intensity at a large distance from centre of wire
 - b) Electric intensity at a point, if wire is infinitely long.
- b) What is polar molecule? Explain the effect of electric field on it.
- c) Define:
 - i) Magnetic susceptibility
 - ii) Magnetic permeability
 - iii) Hysteresis
- d) A charge of 12 nano-coulomb is situated inside a cube. Calculate the electric flux through one of the faces of the cube.
(Given: $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 / \text{Nm}^2$)
- e) An Aluminium wire of diameter 0.4 cm carries a current of 25A. Find the magnetic field at the surface of the wire.
(Given: $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/ Am}$)

Q.4 Attempt any **TWO** of the following: (12)

- a) State and prove Gauss's law in dielectrics.
- b) Using Ampere's law, obtain an expression for magnetic induction inside toroid.
- c) A tightly-wound, long solenoid having 100 turns/cm carries a current of 3A. Find the magnetic intensity H and magnetic field B at the centre of solenoid.

Q.5 Attempt any **TWO** of the following: (12)

- a) Using Gauss's law, obtain an expression for electric intensity due to infinitely long charged wire.
- b) Obtain an expression for electric potential at any point due to electric dipole.
- c) A coil of 20cm radius has 15 turns and carries a current of 3A. Find magnetic field at the centre of the coil.