F.Y.B.SC. SEM – II (CBCS - 2016 Course) : SUMMER - 2019

SUBJECT : PHYSICS: ELECTRICITY & MAGNETISM

Day : Monday
Date : 15/04/2019

S-2019-0815

Time: 03.00 P.M. To 06.00 P.M
Max. Marks: 60

N. B. :

1) All questions are **COMNPULSORY.**
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 symbols have their usual meaning unless otherwise stated.

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

a) C/m^2 is SI unit of _____

i) liner charge density **ii)** surface charge density
iii) volume charge density **iv)** electric dipole moment

b) electric potential at any point on the equator of dipole is _____

i) zero **ii)** infinity
iii) 1 **iv)** -1

c) Magnetic induction at a point along the axis of circular coil carrying current is_____

i) $B = \frac{\mu_o I}{2\pi a}$ **ii)** $B = \frac{\mu_o I}{2r}$
iii) $B = \frac{\mu_o n I a^2}{2\left(a^2 + x^2\right)^{3/2}}$ **iv)** Zero

d) 1 Tesla = _____ gauss

i) 10^4 **ii)** 10^5
iii) 10 **iv)** 1

e) Force acting on a charge of $10\mu C$ in electric field is 0.05 N, electric intensity at that point is _____

i) 5×10^3 N/C **ii)** 0.5×10^5 N/C
iii) 5×10^2 N/C **iv)** 0.5×10^2 N/C

f) Dielectric constant for air is _____

i) K=1 **ii)** K<1
iii) K>1 **iv)** K=0

B) Attempt all of the following questions. **(06)**

a) What is electric intensity at any point in the interior of the spherical conductor?

b) State the limitations of Coulomb's law of electric force.

c) What is toroid?

d) Which material is used to produce permanent magnet?

e) Define current and current density.

f) Find the absolute permeability of iron in SI unit, if its relative permeability is 2000?

P.T.O.

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

a) State and prove Ampere's circuital law.

b) What is Gauss's law in electrostatics? Deduce Coulomb's law from Gauss's law.

c) The parallel plate capacitor of plate area $0.01m^2$ is filled with dielectric of dielectric constant 5. Its capacitance is $2x10^{-10}$ farad and it has been charged to 50 volts. Find electric intensity in dielectric?
$\left[\epsilon_0 = 8.85\times10^{-12}\ C^2 / Nm^2\right]$

d) Distinguish between diamagnetic substance and paramagnetic substance.

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

a) State and explain principle of superposition of forces.

b) Define electric flux, express it in vector form. State its SI unit.

c) Write note on:
i) Polar molecule **ii)** Non polar molecule

d) A toroidal coil has 300 turns. The inner and outer diameters are 22 cm and 26 cm. Calculate magnetic field inside the coil when it carries current of 5A.
$\left[\mu_0 = 4\pi\times10^{-7}\ Wb / Am\right]$

e) Find the value of 1 Bohr magneton.
[Given – h = 6.62 x 10^{-34} Js m_e = 9.1 x 10^{-31} Kg e = $1.6\ x10^{-19}$ C]

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

a) State and prove Gauss's law in dielectric.

b) Using Ampere's law, obtain an expression for magnetic induction at a point within solenoid.

c) Derive an expression for electric intensity at an external point due to uniformly charged non-conducting sphere. Hence determine electric intensity at a point on the surface of sphere of radius 'a'.

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

a) Define:
i) Magnetization **ii)** Magnetic susceptibility **iii)** Magnetic permeability and state their SI units.

b) An aluminum wire of diameter 0.4 cm carries a current of 25 ampere. Find the magnetic induction at the surface of wire.
$\left[\mu_0 = 4\pi\times10^{-7}\ Wb / Am\right]$

c) Obtain an expression for electric intensity at a point due to uniformly charged ring.

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