UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – 2019

Paper: Electricity & Magnetism
Course Code: PHY-103 / PHY-12328   Part – II

Time: 2 Hrs. 45 Min. Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2 Give the short answer of each question   **(2 x 10 = 20)**

i.   What is difference between charging by contact and charging by induction?

ii.   Describe briefly the two properties of electric field lines.

iii.   Explain, electric flux vanishes inside the uniform sphere of charge.

iv.   Describe briefly the difference between insulators and dielectrics.

v.   The value of magnetic field B at a distance z from the center of loop of radius R, is given by $B = \frac{\mu_0 I R^2}{2(R^2+z^2)^{3/2}}$. Compute B at the center of the loop and when z >> R.

vi.   Compute the relation between current and current density.

vii.   Explain the difference between emf and potential difference.

viii. Write the equation for magnetic force on wire segment of length L, carrying current I, placed in a uniform magnetic field B, the direction of current makes angle φ with magnetic field. Explain when magnetic force is zero and maximum.

ix.   What distinguish ferromagnetic materials from paramagnetic materials?

x.   Write four Maxwell's equation of electromagnetism.

Q.3 **(a)** Derive the expression for the potential energy at any angle on an electric dipole, when it isplaced insidethe uniform electric field.   **(6)**

(b) A molecule of water vapor (H_2O) has an electric dipole moment of magnitude p= 6.2 x 10^{-30} C.m. (a) What is the maximum torque on a molecule of H_2O in a typical laboratory electric field of magnitude 1.5 x 10^4 N/C.? (b) The work done in rotating the dipole from $\theta_0 = 180°$ to $\theta= 0°$.   **(4)**

Q.4 **(a)** State Ampere's law. Using Ampere's law show that magnetic field inside the solenoiddepends on current and number of turns per unit length.   **(1,6)**

(b) A solenoid has the length 1.23 m and an inner diameter 3.55 cm. I t has five layers of winding of 850 turns each and carries a current 5.57 A. What is B at its center?**(3)**

Q.5 **(a)** What is motional emf? When a closed conducting loop of width D is moved inside a uniform magnetic field, pointing at right angle to the plane of the loop. Determine the value of induced emf and induced current sets up in the loop.   **(1,3,3)**

(b) A circular UF television antenna has diameter of 11.2 cm. The magnetic field of TV signal is normal to the plane of the loop, and at one instant of time, its magnitude is changing at the rate of 157 mT/s. The field is uniform. Find the emf in antenna.   **(3)**

UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – 2019

Paper: Electricity & Magnetism
Course Code: PHY-103 / PHY-12328   Part – I (Compulsory)   Time: 15 Min. Marks: 10

Roll No. in Fig. ....

Roll No. in Words. ....

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Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. **Encircle the right answer cutting and overwriting is not allowed.** **(10x1=10)**

i. A sphere of radius R has the total charge q, which is uniformly distributed. What is electric field at a points at a distance r greater than the radius of sphere?

(a) $\frac{1}{2\pi\varepsilon_0}\frac{q}{r^2}$ 　　(b) $\frac{1}{4\pi\varepsilon_0}\frac{qr}{r^3}$ 　　(c) $\frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$ 　　(d) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}$

ii. The flux through a flat surface of area A in a uniform electric field $\vec{E}$ is maximum

(a) When the Surface is parallel to $\vec{E}$ 　　(b) When the Surface is perpendicular to $\vec{E}$

(c) The Surface is shaped like square 　　(d) The Surface is shaped like rectangle

iii. Which of the following change to a parallel plate capacitor will result in an increase in the capacitance?

(a) By increasing potential difference across the plates 　(b) By increasing the area of plates

(c) By increasing the charge on plates 　　(d) By increasing the separation of the plates

iv. The current and current density have directions associated with them. Are they vectorquantity?

(a) Only current is vector quantity 　(b) Only current density is vector quantity

(c) Both are vector quantity 　　(d) Both current and current density are not vector

v. An electric dipole of dipole moment $\vec{P}$ in a uniform electric field $\vec{E}$ will experience a minimum potential energy, when the angle between $\vec{P}$ and $\vec{E}$ is

(a) 180° 　　(b) 0° 　　(c) 90° 　　(d) ∞

vi. Biot-Savart law and which of the following law in electrostatics are analogous

(a) Lenz's law 　　(b) Gauss's law 　　(c) Coulomb's law 　　(d) Faraday's law

vii. The material which exhibits the hysteresis is

(a) Diamagnetic 　　(b) Paramagnetic 　　(c) Ferromagnetic 　　(d) All above

viii. Lenz' law is based on principle of

(a) Conservation of charge 　　(b) Conservation of momentum

(c) Conservation of energy 　　(d) Both (a) and (b)

ix. The magnitude of Pointing vector is given by

(a) $\frac{1}{\mu_0}EB$ 　　(b) $\frac{1}{\varepsilon_0}EB$ 　　(c) $\frac{1}{\mu_0}B^2E^2$ 　　(d) $\frac{1}{\mu_0 c}EB$

x. The temperature at which resistivity of a material suddenly drops to zero is called

(a) Absolute temperature 　　(b) Supper cooling temperature

(c) Curie temperature 　　(d) Critical temperature