REG. NO.: _____

COURSE   :   **MAJOR – CORE**
PAPER   :   **ELECTROMAGNETISM**
TIME   :   **3 HOURS**
CODE   :   **19PH/MC/EM54**   **MAX. MARKS: 100**

SECTION -A

Answer ALL questions   **(13x 1 = 13)**

I. CHOOSE THE CORRECT ANSWER

1. In Gauss's theorem, which of the following statements is incorrect
   a) The surface should be opened surface
   b) Electric field at every point is symmetrical
   c) Angle ө at every point is symmetrical
   d) There may be combinations of more than one surface

2. Four charges +q, +q, -q and -q respectively are placed at the corners of square of side 'a'. the electric potential at the centre 'O' of the square is

   a) $\frac{4q}{4\pi\varepsilon_0 a}$ b) $\frac{-4q}{4\pi\varepsilon_0 a}$ c) 0   d) $\frac{-4q}{4\pi\varepsilon_0}$

3. The capacitance of a parallel plate capacitor increases from $5\mu F$ to $60\mu F$, when a dielectric is filled between the plates. The dielectric constant is

   a) 10   b) 12   c) 6   d) 0

4. The magnetic Lorentz force on the charge is zero,
   a) If the charge is at rest
   b) If the direction of motion of the charge is parallel to the magnetic field.
   c) If the direction of motion of the charge is antiparallel to the magnetic field.
   d) All the above

5. Example for paramagnetic materials
   (a) superconductors
   (b) alkali metals
   (c) transition metals
   (d) Ferrites

6. Electromagnetic waves are produced by
   a) a static charge
   b) a moving charge
   c) an accelerating charge
   d) chargeless particles

7. The electric and magnetic field of an electromagnetic waves are

a) in phase and perpendicular to each other

b) in phase and parallel to each other

c) in opposite phase and perpendicular to each other

d) in opposite phase and parallel to each other

8. Two small bar magnets are placed in air at a distance r apart. The magnetic force between them is proportional to
a) r^2
b) r^{-2}
c) r^{-3}
d) r^{-4}

II. FILL IN THE BLANKS

9. All charged bodies of small dimensions in comparison with the distance between them are referred to as _____

10. In Ampere's law, the sum of the quantities B.dl for all the elements in the closed path = _____.

11. Two points P and Q are maintained at the potential of 10 V and -4 V respectively. The work done in moving 100 electrons from P to Q is _____

12. The magnetic susceptibility for diamagnetic substance _____

13. Two coils of self-inductances 2 mH & 8 mH are placed so close together that the effective flux in one coil is completely half with the other. The mutual inductance between these coils are _____

III. ANSWER BRIEFLY   (7 x 3 =21)

14. Do polar molecules align in the direction of electric field - justify

15. What is the basic principle of a ballistic galvanometer?

16. What does the area of the hysteresis curve represent?

17. Can mutual inductance be greater than self-inductance?

18. Difference between soft magnet and hard magnet?

19. State Lorentz force?

20. Define polarisation

SECTION - B

Answer any FOUR (4 x 9 = 36)

1. Describe Poisson's and Laplace's equation and its importance in physics

2. The plates of a parallel plate capacitor have an area of 90 cm^2 each and are separated by 2.5mm. The capacitor is charged by connecting it to a 400V supply. How much electrostatic energy is stored by the capacitor?

3. A rod of magnetic material 0.5m in length has a coil of 200 turns wound over it uniformly. If a current of 2 ampere is sent through it, calculate a) the magnetizing field H, b) the intensity of magnetization M, c) the magnetic induction B and d) the relative permeability µr of the material. Given $\chi_m = 6x10^{-3}$

4. What is Ampere's circuital law? Applying Amperes circuital law, find the magnetic induction due to a straight solenoid.

5. A circular coil has a radius of 0.1m and a number of turns 50. Calculate the magnetic induction at a point (i) on the axis of the coil and distance 0.2m from the centre (ii) at the center of the coil, when a current of 0.1A flows in it.

SECTION - C

Answer any ONE (1 x 30 = 30)

1. (a) State Gauss's law in electrostatics. Apply it to calculate the electric field intensity due to a uniformly charged conducting sphere at point a) Outside the sphere b) At the surface of the sphere c) Inside the sphere.

    (b) What will be the capacity if the sphere between the plates is partially filled with a dielectric slab of thickness `t' and dielectric constant `k'.

2. (a) Derive Maxwell's equation with the cases.

    (b) State Biot – Savart law. Obtain an expression for the magnetic induction at a point due to an infinitely long straight conductor carrying current.