ANSWERS-ASSIGNMENT-1

MCQ

1. (a) North- South
2. (a) Closed loops
3. (a) Tesla
4. (b)Ampere –meter
5. (a) ampere-meter^2
6. (b) vector
7. (b) τ = MB sin θ
8. (a) Emanate from N- pole and enter into S- pole
9. (b) Paramagnetic
10. (d) T^{-1}
11. (c) ferromagnetism
12. (a) Diamagnetism
13. (a) paramagnetic
14. (b) only ferromagnetic substances
15. (a) paramagnetic substances

1 MARK

16. Ampere –metre^2 or JT^{-1}
17. No, magnetic field lines cannot intersect as at the point of intersection there are two directions of magnetic field which is not possible.
18. The direction of magnetic dipole moment is from South Pole to North Pole.
19. Torque r =M X B = MBsinθ
20. Weber/meter^2, Tesla, Newton/ ampere -meter
21. Yes as the bar magnet and solenoid produces equal magnetic field
22. Magnetic lines of force form continuous closed loops because a magnet is always a dipole and as a result, the net magnetic flux of a magnet is always zero.
23. The measure of the magnetisation of the material is called magnetic susceptibility.
24. In electromagnetism, the measure of the resistance of a material against the formation of a magnetic field is called permeability.

25(A). Diamagnetic substances are Bi and Cu.

25(B). It represents Paramagnetic substance.

2 MARKS

26.(a) The magnetic field strength at any point in a magnetic field is defined as the force experienced by unit north pole placed at that point. b) SI unit is Tesla.

27. Magnetic dipole moment is the product of pole strength and magnetic length of the magnet.

28. (i) Magnetic field lines start from a North Pole and end on a South pole.

(ii) Magnetic field lines do not intersect each other.

(iii) Magnetic field lines are crowded where the field is stronger and farther apart where the field lines are weaker.

(iv) Magnetic field lines form closed loops.

29. The intensity of magnetization of a magnetic material is defined as the magnetic moment developed per unit volume of the material when it is placed in a magnetizing field.

30. The substances which at room temperature retain their ferromagnetism for a long time are called permanent magnets. Examples – Cobalt, Steel, Alnico and Ticonal.

31.

PROPERTIES	Diamagnetic material	Paramagnetic material	Ferromagnetic material
Effect of Magnet	Weakly repelled by a magnet.	Weakly attracted by a magnet.	Strongly attracted by a magnet
Effect of Temperature	No effect.	With the rise of temperature, it becomes a diamagnetic.	Above curie point, it becomes a paramagnetic
Permeability	Little less than unity	Little greater than unity	Very high

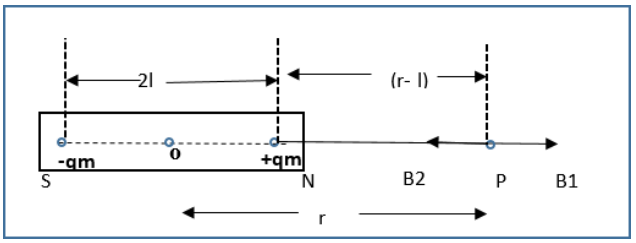
3 MARKS

32.(a) These curves are magnetic field lines. No two such lines intersect each other.

(b) Two such curves never intersect each other, if they do so, then there will be two directions at the point of intersection, which is not possible.

5 MARKS

33.(a)



Consider a magnetic dipole (or a bar magnet) SN of length 2l having South Pole at S and North Pole at N. The strength of south and north poles are – qm and + qm respectively.

Magnetic moment of magnetic dipole m = qm 2l, its direction is from S to N.

Consider a point P on the axis of magnetic dipole at a distance r from mid-point O of dipole.

The distance of point P from N-pole, $r_1 = (r - l)$.

The distance of point P from S-pole, $r_2 = (r + l)$

Let B1 and B2 be the magnetic field intensities at point P due to north and south poles respectively. The directions of magnetic field due to North Pole is away from N-pole and due to South Pole is towards the S-pole. Therefore,

$$B_1 = \frac{\mu_0}{4\pi} \frac{q_m}{(r-l)^2}$$ from N to P and

$$B_2 = \frac{\mu_0}{4\pi} \frac{q_m}{(r+l)^2}$$ from P to S

B1>B2 and direction of resultant is from N to P and magnitude is given by

$$B = B_1 - B_2 = \frac{\mu_0}{4\pi} \frac{2(qm\ 2l)}{(r^2-l^2)2}$$

But qm 2l =M magnetic dipole moment

$$B = \frac{\mu_0}{4\pi} \frac{2(\ )}{(r^2-l^2)2}$$

For a short dipole

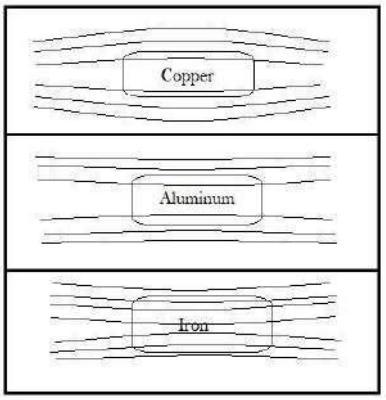
$$B = \frac{\mu_0}{4\pi} \frac{2M}{r^3}$$

(b) Torque $\tau = MB \sin\theta = 4.8X10^{-2}X3X10^{-2} \sin 30 = 7.2x10^{-4}$ Nm.

34. (a) Diamagnetic materials are the materials whose atoms do not possess any permanent magnetic dipole moment due to the presence of electrons that are paired with each other, called paired electrons. This is the reason why when a diamagnetic material is placed in an external magnetic field, the magnetic field lines are repelled.

On the application of an external magnetic field, it creates a magnetic field in the diamagnetic material opposite to the direction of the applied field which causes a repulsive force. This is the reason why when a diamagnetic material is placed in an external magnetic field, the magnetic field lines are repelled.

(b) Magnetic field lines of a current carrying solenoid: When current passed through the solenoid, it acts as bar magnet. One end of the solenoid acts as North Pole and another end acts as South Pole. The magnetic field starts at North Pole and ends at South Pole. The magnetic field lines are always parallel.



Copper:

Copper is a diamagnetic material. The magnetic field produced by the material is repulsive. Thus, the magnetic field lines diverge outward.

Aluminium:

Aluminium is a paramagnetic material. The magnetic field is strengthened around the material. Thus, the magnetic field of lines converges lightly.

Iron:

Iron is a ferromagnetic material. The magnetic field is far strong around the material. Thus, the magnetic field of lines converges heavily.

Assertion and Reason

35.(a) Since no electric lines of forces exist inside a charged body, the electric lines of force only travel from positive to negative charge and are discontinuous. Secondly, magnetic lines of force travel from north to South Pole and inside the magnet they are from South Pole to North Pole hence continuous.

36.(a) A solenoid is a type of electromagnet formed by a helical coil of wire whose length is substantially greater than its diameter, its two ends can be visualised as two coils.

37.(c) Permanent magnets retain their ferromagnetic property for a long period of time and steel is a paramagnetic material.

38.(b) It is the property of a magnet to rest in a geographical north and south pole and another property of magnetic field is that magnetic field lines do not intersect.

39.(a) In the case of diamagnetic substances, the magnetic moments of atoms and the orbital magnetic moments have been oriented in such a manner that the vector sum of an atom’s magnetic moment becomes zero. An external magnetic field can repel them weakly.

40.(d) Neil Bohr proposed a model, which is familiar as a planetary model of atoms. In Bohr’s model, the neutrons and protons occupy a dense central region called the nucleus, and electrons orbit the nucleus much like planets orbiting the sun. Electrons are negatively charged and the nucleus is positively charged. Force in the former case is electrostatic force but in later case itis gravitational force.

41.(a) By using the right hand thumb rule, the direction of the magnetic field can be determined then by using Fleming's right hand rule the direction of force comes towards each other.

42.(d) As the galvanometer is used to check the current flow direction and the magnitude of the direct current. That’s why the resistance of the galvanometer is nearly zero. This is somewhere similar to ammeter but both are different devices. Ammeter can only show us the current magnitude not the direction. A Galvanometer's needle can fluctuate in two directions whereas an ammeter's needle can only show one side deflection.

43.(b) Electric lines of forces do not exist inside a charged body, the magnetic lines of force travel from north to south pole and inside the magnet they are from south pole to north pole hence continuous.

44.(a) If the particle is moving along the direction of magnetic field then $\theta = 0°$ hence force becomes zero.