SAIVEERA ACADEMY – REVOLUTION FOR LEARNING
PEELAMEDU , COIMBATORE - 8098850809
12TH UNIT – 3 75% PORTION TEST

Subject : Physics **Marks :125**

Time : 2 hrs

I. Choose the best answers **15×1 = 15**

1, A non-conducting charged ring of charge q, mass m and radius r is rotated with constant angular speed ω. Find the ratio of its magnetic moment with angular momentum is

a) $\frac{q}{m}$ b) $\frac{2q}{m}$ c) $\frac{q}{2m}$ d) $\frac{q}{4m}$

2. A thin insulated wire forms a plane spiral of N = 100 tight turns carrying a current I = 8 m A (milli ampere). The radii of inside and outside turns are a = 50 mm and b = 100 mm respectively. The magnetic induction at the center of the spiral is

(a) 5 μT (b) 7 μT (c) 8 μT (d) 10 μT

3. The torque on a rectangular coil placed in a uniform magnetic field is large, when

a) the number of turns is large b) the number of turns is less

c) the plane of the soil is perpendicular to the field d) the area of coil is small

4. Phosphor - bronze wire is used for suspension in a moving coil galvanometer, because it has

a) high conductivity b) high resistivity

c) large couple per unit twist d) small couple per unit twist

5. A galvanometer of resistance G is shunted with S. The effective resistance of the combination is Ra.

Then, which of the following statement is true?

a) G is iess than S b) S is less than Ra but greater than G

c) R_a is less than both G and S d) S is less than both G and R_a

6. An ideal voltmeter has

a) zero resistance

b) infinite resistance

c) finite resistance less than G but greater than zero

d) resistance greater than G but less than infinity

7. An electron is moving with a velocity of 3 x $10_6 ms^{-1}$ perpendicular to a uniform magnetic field of induction 0.5T. The force experienced by the electron is

a) 2 . 4 x 1 0 ^{13} N b) 13.6 x 1 0 ^{27} N c) 13.6 x 10^{11} N d)zero

8. When the number turns (n) in a galvanometer is doubled, current sensitivity

a) remains constant b) decreases twice

c) increases twice d) increases four times

9. The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field

is a) finite maximum b) zero c) finite minimum d) infinity

10.When positive charge is moving in a magnetic field , its direction is given by
a)thumb rule b)Left hand rule c)right hand rule d)cork screw rule
11.When the current flowing in the circular coil is doubled , number of turns is halved , the magnetic field at its centre become
a) four times b)half c)same d)double
12.The minimum value of orbital magnetic moment of revolving electron in an atom is called
a) angular momentum b)gyro magnetic ratio c)planck's constant d)Bohr magneton
13.Two parallel conductors of length 10 m carrying current separated by 20 cm in air experiences a force of 0.9 N , then the current in each conductor
a) 40A b) 55A c)300A d)300 nA
14.Two parallel wire carrying current in same direction will experiences a
a)repulsive b) attractive c) magnetic d)electric force
15.The unit of galvanometer constant is
a) Am^{-1} b) $A\ rad^{-1}$ c)AC^{-1} d)As^{-1}

II.Knowledge based questions **15×1 = 15**

1.Explain the sense in which solenoid acts like bar magnet
2.How will the magnetic field at the centre of a circular wire carrying current change , if the current through the wire is doubled and radius of the coil is halved ?
3.Can neutron be accelerated in cyclotron ? Why ?
4.The energy of a charged particle moving in a uniform magnetic field does not change .Why
5.State two factors by which the voltage sensitivity of a moving galvanometer can be increased ?
6.What is main function of soft iron core used in moving coil galvanometer
7.Find whether mobbing coil galvanometer can be converted into ammeter if $I < I_g$?
8.Draw the magnetic lines due to current carrying current loop
9.Define one tesla using the expression for the magnetic force acting on a particle of charge q with velocity v in magnetic field B
10.A particle of charge q and mass m moving with the velocity it is subjected to a uniform magnetic field B directed perpendicular to its velocity .Show that it describes a circular path Write the expression for its radius
11.A straight wire of length L is bent into semi circular loop .Use Biot – Savart's law to deduce an expression for the magnetic field at its centre due to the current passing through it
12.A wire of length L is bent round in the form of a coil having N turns of same radius .If a steady current I flows through it in clockwise direction , then find the magnitude and direction of magnetic field
13.How toroid is different from solenoid
14.Increasing the current sensitivity of a galvanometer may not necessarily increase its voltage sensitivity . Give reasons
15.What is function of radial magnetic field in moving coil galvanometer ?

III.Knowledge based problems **15**

1. The resistance of a moving coil galvanometer is made twice its original value in order to increase current sensitivity by 50%. Will the voltage sensitivity change? If so, by how much?. **(2m)**

2. The coil of a moving coil galvanometer has 5 turns and each turn has an effective area of 2×10^{-2} m^2 . It is suspended in a magnetic field whose strength is 4×10^{-2} Wb m^{-2}. If the torsional constant *K* of the suspension fibre is 4×10^{-9} N m deg^{-1}. (a) Find its current sensitivity in degree per micro - ampere.
(b) Calculate the voltage sensitivity of the galvanometer for it to have full scale deflection of 50 divisions for 25 mV.
(c) Compute the resistance of the galvanometer **(3m)**

3. A metallic rod of linear density is 0.25 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 45º with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of strength 0.25 T is acting on it in the vertical direction. Calculate the electric current flowing in the rod to keep it stationary. **(2m)**

4. An electron moving perpendicular to a uniform magnetic field 0.500 T undergoes circular motion of radius 2.80 mm. What is the speed of electron? **(3m)**

5. Compute the magnitude of the magnetic field of a long, straight wire carrying a current of 1 A at distance of 1m from it. Compare it with Earth's magnetic field. **(2m)**

6.A circular coil of 200 turns and radius 10 cm is placed in a uniform magnetic field of 0.5 T , normal to the plane of the coil .If the current in the coil is 3 A .Calculate total torque , total force , average force on each electron in the coil due to magnetic field .Assume area of cross-section of the wire to be 10^{-5} m^2 and the free electron density is 10^{29} / m^3 **(3m)**

IV.Very Short answers **10×2 = 20**

1. State Ampere's circuital law
2. Difference between Coulomb's law and Biot – Savart law
3. State Right hand thumb rule
4. Define the magnetic dipole moment of any current loop
5. Define one tesla
6. Define Figure of merit of a galvanometer
7. How will you increase the current sensitivity of a galvanometer
8. Define voltage sensitivity
9. Define one ampere
10. State Fleming's left hand rule

V.Short answers **10 × 3 = 30**

1.How is moving coil galvanometer is converted into a voltmeter ? Explain with necessary circuit diagram and the required mathematical relation used

2.Find the expression for magnetic dipole moment of revolving electron .What is Bohr magneton ?

3.Show that for an ideal toroid of closely wound turns , the magnetic field i) inside the toroid is constant ii) the open space inside an exterior to toroid is zero .

4.A particle of mass m & charge q with a uniform speed v normal to magnetic field B describes a circular path of radius r .Derive expression for i) Radius of the circular path ii)Time period of revolution iii)Kinetic energy of the particle

5. Find the magnetic induction due to a straight conductor using ampere's circuital law

6. State Biot – Savart's law

7. Derive Force on a current carrying conductor placed in a magnetic field

8. How is moving coil galvanometer is converted into a ammeter ? Explain with necessary circuit diagram and the required mathematical relation used

9.Show that Current loop behaves as a magnetic dipole

10.Explain about Force on a moving charge in a magnetic field

VI.Long answers **6 ×5 = 30**

1.Depict the magnetic field lines due to two straight , long parallel conductor carrying current I_1 & I_2 in the same direction .Hence deduce an expression for force per unit length acting on one of the conductors due to other .Is this force attractive or repulsive ?

2.Describe briefly about construction , working of a moving coil galvanometer

3.Using Biot- Savart's law deduce an expression for the magnetic field on the axis of a circular current carrying loop

4.Write an expression for force experienced by charged particle moving in a uniform magnetic field With the help of labelled diagram explain the working of cyclotron ? Show that frequency is independent on speed of particle

4. Deduce the relation for the magnetic induction at a point due to an infinitely long straight conductor carrying current

5. Discuss the principle , working , limitations of cyclotron in detail

6. Calculate the magnetic field inside and outside of the long solenoid using Ampere's circuital law