12. ELECTROMAGNETISM

1 Mark Questions

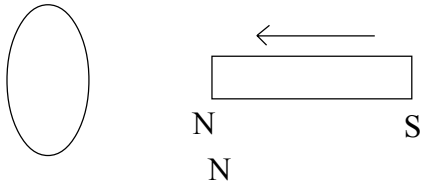
I. 1. Define Magnetic Flux density ? (As–1)

Ans. Magnetic flux density (b) is defined as the ratio of flux passing through a plane perpendicular to field and the area of the plane.

2. Are the magnetic linus closed ? Why ? (As–1)

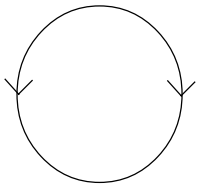
Ans. Magnetic lines are imaginarylines or curves forms around the magnet. So the magnaticlines are closed curves.

3. A bar magnet with north pole facing to wards coil moves as shown in figure. What happens to magnetic fluc passing through the coil ? (As–1)



Ans. If the magnetic flux passing through a coil then current is generated in the coil.

4. The direction of current flowing in a coil is shown in figure what types magnetic pole is formed at the face that the flow of current as shown in figure ? (As–1)

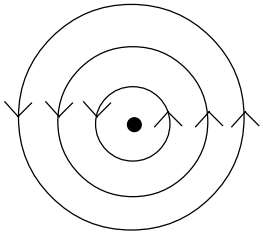


Ans. North pole is forms at the face that has flow of current as shown in the figure.

5. Why do the picture appear distorted when a bar magnet is brought close to the screen of a television ? (As–1)

Ans. The picture appear distorted when a bar magnet is brought close to the screen television due to the fact that magnetci field excerts a force on the moving charge.

6. In the following figure magnetic linus are shown. In what direction does the current through wire flow ? (As–1)



Ans. In the diagram the magnetic lines are anticlock wise direction. According to ampere right hand rule the direction of current is vertically up wards.

7. What is the magnetic force on the charge moving parallel to a magnetic field ? (As–1)

Ans. When charge moves parallel to the magnetic field the value of θ becomes zero in F = qv B sin θ then F = q vB sin 0 = 0. So the charge experiences no force when it is moving parallel to the magnetic field.

8. State the Faraday's Law ? (As–1)

Ans. The induced EMF generated in a closed loop is equal to the rate of change of magnetic flux passing through it.

9. State the Lenz's Law ? (As–1)

Ans. The induced current set up in the coil is in such a direction that it opposes the changes in the flux.

10. A coil is kept perpendicular to page. At p current flows in to the page and at Q it comes oot of the page as shown in the following figure. What is the direction of the magnetic field due to coil ? (As–1)

Ans. At the top near Q. The direction of magnetic field is anticlock wise direction and at the boton near p, the direction of magnetic field is clock P wise direction

2 Mark Questions

11.What are the differences between electric motor and a generator ? (As–1)

Ans.

Electric motor	Generator
1. Motor converts electrical energy into mechanical energy. 2. Works on the principle of Fleming's left hand rule.	1. Converts methcanical energy to electrical energy. 2. Wroks on the principle of Flemings right hand rule.l

12. What is a sole noid ? Mention two ways to increase the strength of the field of a solenoid ? (As–1)

Ans. A coil of many circular turns of insulated copper wire wrapped closely in the shape of clinder is called a solenoid.

Two ways to increase the strength of the field of a solenoid.

1. By increasing the number of turns
2. By increasing current

13. Lateef said to you that the magnetic field lines are open and they start at north pole of bar magnet and end at south pole. What questions do you ask lateef to correct him by saying" field lines are clsoed" ? (As–2)

Ans. 1) How can you say the alignonent of lines passing through magnet ?
2) Why the direction of force on a north pole is always same ?
3) If magnetic lines are open why magnetic lines start from north pole ?
4) Why the lines are concentric circle around a current carrying wire ?

14. Collect information about generation of current by using faraday's law ? (As–4)

Ans. 1) Dynomo is working on the principle of Faraday's Law.
2) Dynamo consists stator provides constant magnetic field.
3) It rotates armature.
4) Armature turn with in magnetci field induced emf produced which is Faraday's Law.

15. Find the length of the conductor which is moving with a speed of 10m/sec in the perpendicolar to the direction of magnetic field of induction 0.8 T, if it induces an emf of 8v between the ends of the conductor.

Ans. Speed v = 10/m sec
magnetic field of induction B = 0.8 T
E.M.F $\varepsilon = 8v$
The electro motive force e.m.f
$\varepsilon = BlV$
$8 = 0.8 \times l \times 10'$
$0.8 \times 10 \times l = 8$

$$\frac{8}{10} \times 10 \times 1 = 8$$

$$l = \frac{8}{8} = 1$$

$\therefore$ The length of the conductor l = 1 meter

16. How do you appreciate Farwday's Law, which is the consequence of conservation of energy ? (As–6)

Ans. 1) Law of conservation of energy says energy neither be created nor be destroyed but can be converted from one form to an other.
2) Faraday's Law says whenever there is a continuous change of magnetic flu linked with a closed coil, a current is generated in the coil. This induced emf is equal to the rate of change of magnetic flux passing through it.
3) We have to do some work to move the magnet through a cell. This work produced energy.
4) This energy is converted into electrical energy in the coil.
5) So conservation of energy takes place in electromagnetic induction.

17. How do you appreciate the relation between magnetci field and electricity that changed the life style of mankind ? (As–1)

Ans. 1) Changing life style of mankind is a result of many inventions, utilising a lot of scientific principles.

2) Scientiests always going to searching for new principles and new applications to make our life more confortable.

3) If you consider electricity, right from amberstone to nuclear power, so many changes have been incorporated.

4) The idea of ested and Fraday that current carrying wire produces electricity and electromagnetic induction, enable use to electric motors, generators fans, mixers, grinders, induction stoves.

All the applications makes our life more confortable. hence Farday and oersted rendered a lot of serves in this field.

18. What are magnetic field lines ? List any two characteristics of field lines ?

Ans. A magnetic field line is a patch along which a free north pole tends to move.

Characteristics :

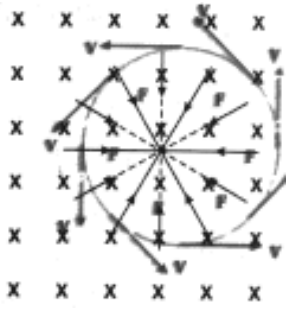
1) Outside a magnet the magnetic field lines are directed from N-Pole of magnet towards S-pole however inside a magnetic field lines are directed from spole to N pole.

2) The relative strength of magnetic field lines is given by degree of close ness of the field lines more corocoded field lines means a stronger field.

4 Mark Questions

19. A charged particle q is moving with a speed 'v' perpendicular to the magnetic field of induction B. Find the radius of the path and time period of the particle ? (As–1)

Ans. Let us assume that the field is directed into the page as shown infigure. Then the force experienced by the partide is F = mqvB. We know that this force is always directed perpondicular to velocity. Hence the particle moves along a circular path and the magnetic force on acharged particle acts like a centripetal force.



Let r be the radius of the circolar path

We know that centripetal force = $\frac{mv^2}{r}$

$qvB = \frac{mv^2}{r}$

Solving the equation, we get $r = \frac{mv}{Bq}$

Time period of the particle $T = \frac{2\pi r}{V}$

Substituting r in above equation use get T = $\frac{2\pi m}{Bq}$

20. Collect information about material required and procedure of making a simple elecric motor from internet and make a simple motor on your own. (As–4)

Ans. Aim : Preparation of a simple electric motor

Materials required : A wire of 15 cm, 1.5V battery, iron mail, strong magnet, paper chip.

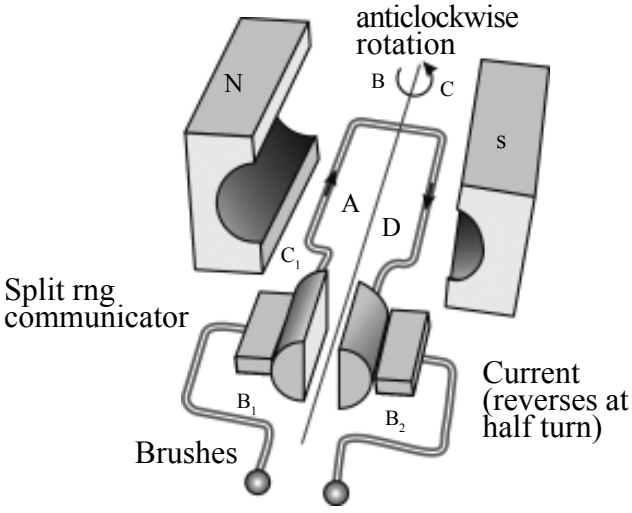
Procedure :

1) Attach the magnet to the head of the iron nail.
2) Attach a paper clip to the open end of the magnet.
3) Now attach the other end of the nail to the cap of the battery.
4) Now connect the negative terminal of the battery and the head of the iron nail trough a wire.
5) We observe that the paper clip rotates.

21. Explain the working of electric motor with aneat diagram ? (As–3)

Ans. Electric motor : A motor is a device which converts electrical energy into mechanical energy.

Principle of motor : A motor works on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it. A force acts on the coil which rotates it continuously.



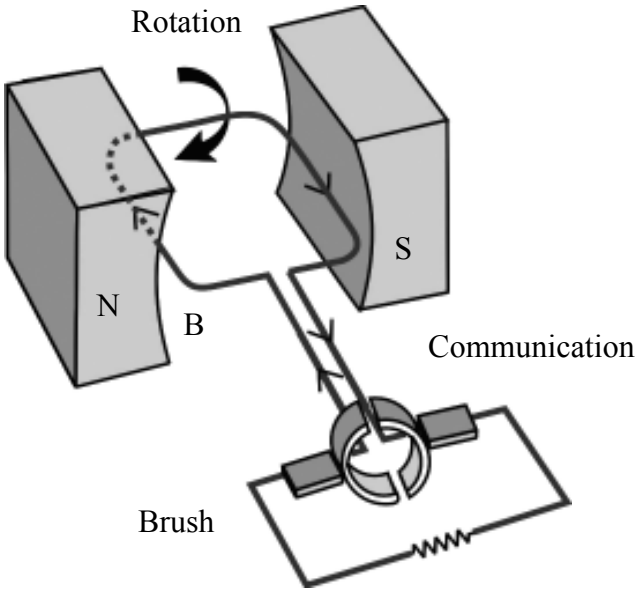
Working of electric motor :

1) When electric current is passed into the rectangular coil, this current produces a magnetic field around the coil.
2) The magnetic field of horse shoe type magnet then interacts with the magnetic field of the coil and causes the coil to rotate continuously.

3) If ABCD is in horizontal position current from battery enters the coil through brush B_1, and commutator half ring C_1. The current flows in the direction ABCd and leavces ring and brush B_2.
4) The direction of current is from A to B, the direction of current is from C to D. Where as the force on the side C of the coil is in the upward direction. ABCD rotats in anticlock wise direction.
5) While rotating when the coil reaches vertical position then the brushEs B_1 and B_2 will touch the gap between the commutator rings and current to the coil is cUt of.
6) The coil CD comes on the left side and AB comes to the right side. Again they come in contact with brush B_1, current direction is reversed.
7) the revesing of current in the coil is repeated after every half rotation due to which the coil continue to rotate as long as current from the battery is passed through it.

22. Explain the working of DC generator with a neat diagram ? (As–1)

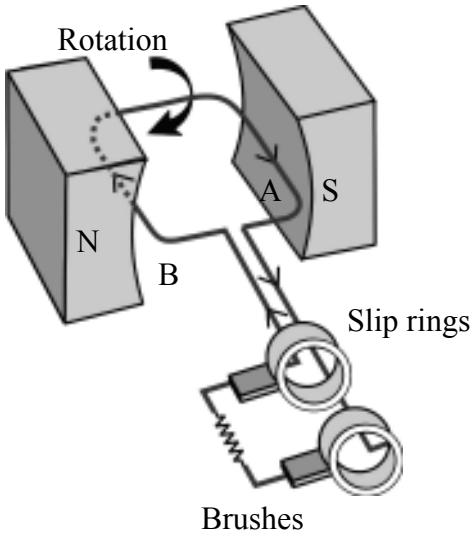
Ans. 1) If two half slip rings are connected to ends of the coil the AC generator works as DC generator to produce DC current.
2) When the coil is in the vertical position the induced current generated during the first half rotation rises from zero to mascimum and then falls to zero again.
3) As the coil moves further from this position the ends of the coil go to other slip rings.
4) Hence during the second half rotation the current is reversed in the coil itself, the current generated in the second half rotation of the coil is identifical with that during the first half of direct current.



5 Mark Questions

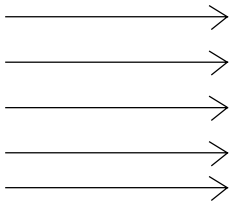
23. Draw neat diagram of an AC generator ?

Ans.

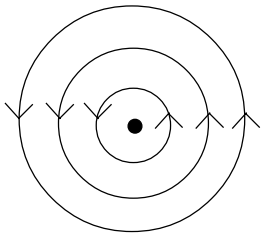


24. Draw the diagrams showing (a) Field lines due to horse shoe magnet between its poles and (b) current into the page

Ans.



Field lines due to horse shoe magnet between its poles



Current into the page

PART – B

I. Fill in the blanks.

1. Electrical energy is converted into mechanical energy in .....
2. Mechanical energy is converted into electrical energy in .....
3. the induced current set up in the coil is in such a direction that it opposes the changes in the flux is .....
4. Current carrying wire produces .....
5. The S.I. unit of magnetic field induction is .....
6. Magnetic flux is the product of magnetic field induction and .....
7. Faraday's Law of induction is the consequences of .....
8. The device used for producing Electric current is called a .....
9. The magnetic lines of force of a straight conductor carrying current are .....
10. The device based on the principle of electromagnetic induction is .....
11. A current that flows in the some direction is ..... current.
12. A generator with commutator produces ..... current.

II. Matching.

I.	**A**		**B**
1.	Magnetic field strength	( )	A. Weber
2.	Imaginary linces of force	( )	B. Tesla
3.	Magnetic flux	( )	C. Oersted
4.	Magnetic flux density	( )	D. Magnetic field
5.	current carrying wire	( )	E. Magnetic lines

II.	**A**		**B**
1.	Dynamo rule	( )	A. Gauses
2.	Magnetic field	( )	B. $NA^{-1}\ m^{-1}$
3.	Electro magnet	( )	C. Fleming's right hand rule
4.	Force on a current carrying conducor	( )	D. BA
5.	Tesla	( )	E. Microphones

Answer

I. 1) Electric motor 2) Generator 3) Lenzs Law
4) Magnetic field 5) Tesla 6) Area
7) Law of conservation of energy 8) Generator
9) concertric circles 10) Electric generator 11) Direct
12) Direct

I. 1) C 2) E 3) A 4) B 5) D

II. 1) C 2) A 3) E 4) D 5) B

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