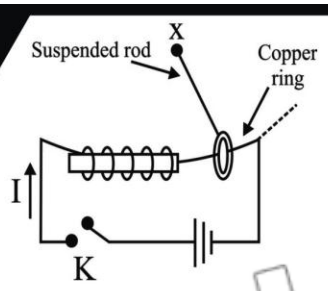

Chapter 15

ELECTROMAGNETIC INDUCTION

TOPICAL MULTIPLE CHOICE QUESTIONS

Topic 15.1

KIPS MCQS

Induced emf and Induced Current

(1) In 1831 Faraday in England and hennery in USA observed that an e.m.f is set up in conductor when it moves across a _____

(a) Electric field **(b)** Magnetic field
(c) Gravitational field **(d)** All of the above

(2) An induced current can be generated when

(a) Coil of constant area is rotated in a constant magnetic field.
(b) The coil moved towards a stationary magnet
(c) The magnet moved towards a stationary coil
(d) All of the above

(3) The direction of induced current is found by the use of

(a) Faraday's law **(b)** Lenz's law
(c) Ampere's law **(d)** Newton's law

(4) Induced current depends upon

(a) the speed of the conductor **(b)** resistance of the loop
(c) both a and b **(d)** none of these

(5) The induced emf leads to an induced current when the circuit is

(a) open **(b)** closed
(c) both a and b **(d)** none of these

(6) The greater the rate of change in flux

(a) the larger the motional emf **(b)** the smaller the induced current
(c) the greater the induced emf **(d)** the smaller the motional emf

(7) The induced current in the loop can be increases by

(a) moving the coil faster **(b)** using a stronger magnetic field
(c) replacing the loop by a coil of many turns **(d)** all of these

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(8) If we make the magnetic field stronger, the value of induced current SGD-2017 (G-II)

(a) decreased **(b)** increased
(c) vanished **(d)** kept constant

(9) Emf is induced due to change in: SGD-2022 (G-I)

(a) electric flux **(b)** magnetic flux
(c) electric potential **(d)** electric current

(10) Electric current produces magnetic field was discovered by : MTN-2019 (G-I)

(a) Faraday **(b)** Maxwell
(c) Oersted **(d)** Lenz

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(11) The emf induced in a coil which is rotating in magnetic field does not depend on
(a) Speed of rotation **(b)** Numbers of turns of coil
(c) Resistance of coil **(d)** Area of coil

Topic 15.2:

Motional EMF

(12) The e.m.f produced in a conductor while moving through a magnetic field produces a current in the conductor, this current is called.
(a) eddy current **(b)** Drift current
(c) induced current **(d)** All of the above.

(13) Alternating emf is produced by rotating a rectangular coil of wire in
(a) magnetic field . **(b)** electric field
(c) conservative field **(d)** gravitational field

(14) The magnitude of motional emf is given by
(a) $\varepsilon = -vBL\sin\theta$ **(b)** $\varepsilon = -vBL\cos\theta$
(c) $\varepsilon = vBL\tan\theta$ **(d)** $\varepsilon = vBL\sin\theta$

(15) The unit of emf is
(a) ampere **(b)** volt
(c) weber **(d)** tesla

(16) The motional emf depends upon
(a) strength of magnet **(b)** length of conductor
(c) speed of conductor **(d)** all of these

(17) The unit of emf is same as the unit of
(a) current **(b)** potential difference
(c) capacitance **(d)** inductance

(18) The motional emf induced in a rod moving perpendicular to a magnetic field is given by
(a) $\varepsilon = -vBL$ **(b)** $\varepsilon = 0$
(c) $\varepsilon = vBL$ **(d)** $\varepsilon = -1$

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(19) When a conductor moves across a magnetic field, an emf is set up. This emf is called **SGD-2017 (G-I)**
(a) variable emf **(b)** constant emf
(c) induced emf **(d)** back emf

(20) The motional emf depends upon the **SGD-2017 (G-I)**
(a) length of conductor **(b)** speed of conductor
(c) strength of magnet **(d)** all of these

(21) A metal meter rod is moving at the speed of 0.5 ms^{-1} in the direction parallel to a 0.5 T, magnetic field, emf will be: **LHR-2022 (G-II)**
(a) 0.25 V **(b)** 0.5 V
(c) Zero **(d)** 0.125 V

(22) A rod of unit length is moving at 90^{o} through a magnetic field of 1 T. If the velocity of the rode is 1 m/s then induced in rode will be **DGK-2022 (G-II)**
(a) 1V **(b)** 0.25V
(c) 0.5V **(d)** 0.6V

(23) The motional emf depends upon _____. **RWP-2022 (G-II)**

(a) length of conductor **(b)** magnetic
(c) speed **(d)** all of these

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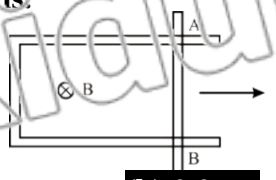
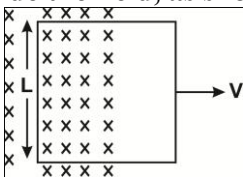
(24) A 50 cm long bar AB is moved with a speed of 4 ms^{-1} in a magnetic field B= 0.01 T as shown in Fig. The emf generated is.



(a) 0.01 V **(b)** 0.02 V
(c) 0.03 V **(d)** 0.04 V

(25) A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane of the loop at the loop exists everywhere with half the loop outside the field, as shown in figure. The induced emf is



(a) Zero **(b)** vBR
(c) vB/R **(d)** vBL

Topic 15.3 & 15.4:

Faraday's Law and Induced EMF, Lenz's Law and Direction of Induced E.M.F

(26) The average e.m.f induce in a conducting coil of N loops is equal to the negative of the rate at which the magnetic flux through the coil is changing with time. This statement is
(a) Coulomb's Law
(b) Faraday's Law of electromagnetic Induction
(c) Lenz's Law
(d) None of the above.

(27) Whenever an e.m.f and current is set up by change of magnetic flux through a circuit its direction will be such as to oppose the act which caused it. This is known as.
(a) Lenz's law **(b)** Faraday's law
(c) Kirchhoff's Law **(d)** Ohm's Law

(28) The Lenz's law refers to induced currents and not to induced
(a) field **(b)** magnetic flux
(c) emf **(d)** none of these

(29) In the relation $\varepsilon = -N\frac{\Delta\phi}{\Delta t}$ the negative sign shows that the direction of induced emf is such that it opposes the
(a) change in magnetic flux **(b)** change in electric flux
(c) both a and b **(d)** none of these

(30) According to Lenz's law the 'push' in the magnet is
(a) change that produces induced current
(b) change that produces induced emf
(c) change that produces induced potential difference
(d) all of these

(31) Heinrich Lenz's was a
(a) Russian physicist **(b)** French physicist
(c) German physicist **(d)** English physicist

(32) Lenz's law is in accordance with the law of conservation of
(a) mass **(b)** momentum
(c) energy **(d)** charge

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(33) Lenz's law deals with the: **GRW-2019 (G-I)**
(a) magnitude of induced current **(b)** direction of induced emf
(c) direction of induced current **(d)** magnitude of induced emf

(34) Emf is induced due to change in **GRW-2019 (G-II)**
(a) electric flux **(b)** magnetic flux
(c) electric potential **(d)** electric current

(35) Electromagnetic induction obeys law of conservation of: **BWP-2017 (G-I)**
(a) charge **(b)** energy **(c)** momentum **(d)** mass

(36) Lenz's law deals with: **BWP-2017 (G-I)**
(a) direction of emf **(b)** magnitude of emf
(c) direction of induced current **(d)** resistance

(37) The Lenz's law is also a statement of : **MTN-2019 (G-I)**
(a) Law of Conservation of Momentum
(b) Law of Conservation of Charge
(c) Law of Conservation of Energy
(d) Law of Conservation of Electromagnetic Induction

(38) The term $\frac{\Delta\phi}{\Delta t}$ has the same units as: **MTN-2019 (G-II)**
(a) Time **(b)** Current
(c) Electromotive force **(d)** Magnetic flux

(39) Lenz's law is also a statement of law of conservation of: **LHR-2022 (G-II)**
(a) Linear momentum **(b)** Angular momentum
(c) Energy **(d)** Charge

(40) The direction of the induced current is always so as to oppose the change which causes the current **BWP-2022 (G-II)**
(a) Faraday's Law **(b)** Len's Law
(c) Ohm's Law **(d)** Kirchhoff's Law

(41) Len's law is the manifestation of conservation of _____ **BWP-2022 (G-II)**
(a) current **(b)** voltage
(c) energy **(d)** all of these

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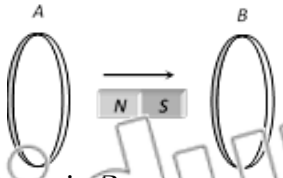
(42) A coil of wire is arranged with its plane perpendicular to a uniform magnetic field of flux density B. when the radius of the coil increases from r_1 to r_2 in time Δt, then what is the emf induced in the coil?
(a) $\frac{\pi B\left(r_2^2 - r_1^2\right)}{\Delta t}$ **(b)** $\frac{\pi B\left(r_2 - r_1\right)^2}{\Delta t}$
(c) $\frac{B\left(r_2^2 - r_1^2\right)}{\Delta t}$ **(d)** $\frac{\pi B\left(r_2^2 + r_1^2\right)}{\Delta t}$

(43) In the diagram shown if a bar magnet is moved along the common axis of two single turn coils A and B in the direction of arrow



(a) Current is induced only in A & not in B
(b) Induced currents in A & B are in the same direction
(c) Induced currents in A & B are in opposite directions
(d) Current is induced only in B and not in A

Topic 15.5 & 15.6:

Self Induction and Mutual Induction

(44) The phenomenon in which a changing current in one coil induces an emf in another coil is called
(a) mutual induction. **(b)** self induction
(c) magnetic induction **(d)** none of these

(45) One Henry (H) equals
(a) Vs A **(b)** Vs A^2
(c) Vs A^{-1} **(d)** Vs A^{-2}

(46) The phenomenon in which a changing current in a coil induces an e.m.f in itself is called.
(a) Mutual inductance **(b)** Mutual induction
(c) Self inductance **(d)** Self induction

(47) Self inductance of a coil depends upon.
(a) Number of turns of the coil **(b)** Area of cross-section of the coil
(c) The core material **(d)** All of the above

(48) In the equation $\varepsilon_L = -L\frac{\Delta I}{\Delta t}$ the negative sign indicates that
(a) The self induced current opposes its cause
(b) The self induced e.m.f opposes the change which produces it.
(c) The accordance of equation with the Lenz's Law
(d) All of the above.

(49) The inductance of a closed circuit with a magnetic flux of 1 weber per ampere
(a) 1 volt **(b)** 1 henry
(c) 1 ampere **(d)** 1 Joule

(50) In A.C the inductors behave like
(a) capacitors **(b)** resistors
(c) insulators **(d)** transistors

(51) The mutual inductance (M) can be expressed by
(a) $M = \frac{\varepsilon}{\Delta I_p / \Delta t}$ **(b)** $M = \frac{\varepsilon_L}{\Delta I_p / \Delta t}$
(c) $M = \frac{\varepsilon_p}{\Delta t / \Delta I_p}$ **(d)** $M = \frac{\varepsilon_s}{\Delta t / \Delta I_p}$

(52) If one volt emf is induced in a coil by changing current at a rate of 1 ampere per second in the coil, then self inductance is called
(a) 1 henry **(b)** 1volt
(c) 1 weber **(d)** 1 ohm

(53) Self inducting coils are called
(a) inductors **(b)** conductors
(c) insulators **(d)** semiconductors

(54) Self induced emf is also sometimes called
(a) back emf **(b)** variable emf
(c) motional emf **(d)** all of these

(55) The relation for the self inductance of the coil is
(a) $L = \frac{N\phi}{I}$ **(b)** $L = \frac{I\phi}{N}$
(c) $L = \frac{N}{I\phi}$ **(d)** $L = \frac{I}{N\phi}$

(56) Unit of inductance is
(a) henry **(b)** $Vs\ A^{-1}$
(c) Ω s **(d)** all of these

(57) The unit of ratio of self inductance to the mutual inductance is
(a) henry **(b)** tesla
(c) VsA **(d)** no unit

(58) If the wire is wound on an iron core its flux would be
(a) remain same **(b)** decreases
(c) increases **(d)** zero

(59) The ratio of average emf induced in the secondary coil to the time rate of change of current in the primary is called
(a) self induction **(b)** mutual inductance
(c) motional emf **(d)** electrostatic induction

(60) Self inductance of a coil does not depend on
(a) nature of material **(b)** current
(c) magnetic flux **(d)** both b and c

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(61) Mutual induction has a practical role in the performance of the GRW-2019 (G-II)
(a) motor **(b)** generator
(c) choke **(d)** transformer

(62) Mutual inductance of two coils does not depends on. GRW-2022 (G-I)
(a) Number of turns of coil **(b)** Area of cross section of coil
(c) Density of material of coil **(d)** None of these

(63) A direct current of 5 ampere is given to primary coil, then the voltage developed across secondary coil is GRW-2022 (G-II)
(a) 5V **(b)** 0V
(c) 10V **(d)** 2V

(64) One of the applications of mutual induction is: FSD-2019 (G-I)
(a) Choke **(b)** Rectifier
(c) Rheostat **(d)** Step up transfer

(65) The inductance of a coil can be increased by using SWL-2017
(a) air as core material **(b)** iron as core material
(c) copper as core material **(d)** bismuth as core material

(66) The practical application of the phenomenon of mutual induction is. MTN-2022 (G-I)
(a) electric motor **(b)** transformer

(c) A.C generator **(d)** D.C generator

(67) Unit of self-inductance is: **LHR-2021 (G-I), LHR-2022 (G-I)**

(a) Weber **(b)** Henry

(c) Tesla **(d)** Farad

(68) Henry is equal to.

MIRPUR (AJK) 2017, DGK 2017 (G-II) LHR-2019 (G-II), FSD-2019 (G-I), DGK-2022 (G-II)

(a) VSA^{-1} **(b)** $VS^{-1}A$

(c) $V^{-1}SA$ **(d)** $V^{-1}S^{-1}A$

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(69) An inductor coil of inductance L is divided into two equal parts and both parts are connected in parallel. The net inductance is:

(a) L/4 **(b)** 4L

(c) 2L **(d)** L/2

(70) Which of the given formula shows the most correct dependence of self-inductance of a coil?

(a) $L = \frac{N\phi}{I}$ **(b)** $L = \mu_o n^2 A\ell$

(c) $L = \frac{\mu_o N^2 A}{l}$ **(d)** All of these

Topic 15.7:

Energy Stored in an Inductor

(71) The work done by the battery in moving a small charge Δq against the induced e.m.f is

(a) $W = \Delta q\ \varepsilon_L$ **(b)** $W = \Delta q / \varepsilon_L$

(c) $W = 1/\Delta q\ \varepsilon_L$ **(d)** $W = \varepsilon_L / \Delta q$

(72) An inductive coil used for restricting the flow of A.C while allowing D.C to pass through it is called

(a) Shunt **(b)** Choke

(c) Resistance **(d)** None of the above

(73) The energy stored in an inductor is

(a) $U_m = \frac{1}{2}LI$ **(b)** $U_m = \frac{1}{2}LI^2$

(c) $U_m = \frac{1}{2}L^2I$ **(d)** $U_m = \frac{1}{4}LI^2$

(74) The work stored in the inductor as

(a) K.E **(b)** P.E

(c) nuclear energy **(d)** chemical energy

(75) An expression for energy density is given by

(a) $U_m = \frac{1}{2}\left(\frac{B}{\mu_o}\right)^2$ **(b)** $U_m = \frac{1}{2}\left(\frac{B^2}{\mu_o}\right)$

(c) $U_m = \frac{1}{4}\left(\frac{B^2}{\mu_o}\right)$ **(d)** $U_m = \frac{1}{2}\left(\frac{\mu_o}{B^2}\right)$

(76) The energy stored in the inductor is due to

(a) magnetic field **(b)** electric field

(c) gravitational field **(d)** all of the these

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(77) Energy stored per unit volume in magnetic field is called: LHR-2017 (G-I)

(a) electric flux **(b)** energy density

(c) work **(d)** power

(78) When current flowing through an inductor is doubled, then energy stored in it becomes: GRW-2019 (G-I)

(a) half **(b)** four times

(c) one fourth **(d)** double

(79) The energy stored in inductor is: LHR-2021 (G-I)

(a) $\frac{1}{2}LI^2$ **(b)** $\frac{1}{2}LI$

(c) $\frac{1}{2}L^2I$ **(d)** $\frac{1}{2}L^2I^2$

(80) If the magnetic field intensity is doubled then magnetic energy density becomes. BWP-2022 (G-I), GRW-2022 (G-I)

(a) Four times **(b)** Two times

(c) Half **(d)** Eight times

(81) If 10 A current passes through 100 mH inductor, then energy stored is DGK-2017 (G-I)

(a) 100 J **(b)** 5 J

(c) 20 J **(d)** zero

(82) The energy stored in the inductor per unit volume is: LHR-2022 (G-I)

(a) $\frac{B^2}{2\mu_o^2}$ **(b)** $\frac{\mu_o}{2B}$

(c) $\frac{\mu_o}{2B^2}$ **(d)** $\frac{B^2}{2\mu_o}$

(83) The energy stored in the inductor becomes four times if_____. RWP-2022 (G-I)

(a) self-inductance is doubled **(b)** current is doubled

(c) both inductance and current are doubled **(d)** current is halved

(84) Which type of energy is stored in inductor? RWP-2022 (G-I)

(a) electric energy **(b)** magnetic energy

(c) potential energy **(d)** gravitational energy

ENTRY TEST MCQS

(85) A coil of 10 H stores energy 80 J when current 4 A flows through it. What is the energy stored if current decreased to 2 A?

(a) 20 J **(b)** 40 J

(c) 10 J **(d)** 25 J

(86) Energy density of a coil having n turns per unit length and I current flowing through it is written as

(a) $\frac{1}{2}\mu_o n^2 I^2$ **(b)** $\frac{1}{2}\frac{n_2 I_2}{\mu_o}$

(c) $\frac{1}{2}\frac{nI}{\mu_o}$ **(d)** None of these

Topic 15.8:

Alternating Current Generators

(87) A device which converts mechanical energy into electrical energy is called
(a) motor **(b)** inductor
(c) transformer **(d)** current generator

(88) The principle of an electric generator is based on
(a) Faraday's law **(b)** Coulomb's law
(c) Ampere's law **(d)** Lenz's law

(89) The working of A.C generator is based upon the
(a) self induction **(b)** mutual induction
(c) electromagnetic induction. **(d)** all of these

(90) An A.C is measured with the help of
(a) heating effect. **(b)** magnetic effect
(c) chemical effect **(d)** both a and b

(91) The number of coils are wounded around an iron cylinder which is rotated in the magnetic field is called
(a) slip rings **(b)** armature
(c) Commutator **(d)** electromagnet

(92) Faraday's generator with which he was able to produce a continuous induced current called
(a) tri polar generator **(b)** multipolar generator
(c) dipolar generator **(d)** homopolar generator

(93) The armature is rotated by a
(a) turbine by a water fall **(b)** fuel engine
(c) both a and b **(d)** none of these

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(94) Maximum emf generated in a generator is: **LHR-2019 (G-II)**
(a) $\varepsilon_o = \varepsilon \sin\theta$ **(b)** $\varepsilon = \varepsilon_o \sin\theta$
(c) $\varepsilon_o = N\omega AB\sin\theta$ **(d)** $\varepsilon_o = N\omega AB$

(95) The principle of an electric generator is based upon: **GRW-2022 (G-I)**
(a) Ampere's law **(b)** Faraday's law
(c) Coulomb's law **(d)** Kirchhoff's law

(96) Which of the following is not present in A.C generator? **GRW-2022 (G-II)**
(a) Split ring **(b)** Carbon brushes
(c) Magnetic field **(d)** Armature

(97) If the angular frequency of A.C generator increased to double, the time period would become. **SGD-2022 (G-II)**
(a) half **(b)** double
(c) $\frac{1}{4}$ time **(d)** 4 time

(98) For A.C generator $I = I_o \sin 2\pi ft$. instantaneous current at $t = \frac{T}{4}$ is. **MTN-2022 (G-II)**
(a) zero **(b)** I_o
(c) $\frac{I_o}{2}$ **(d)** $\frac{I_o}{\sqrt{2}}$

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(99) The diagram shows how the e.m.f. of a simple generator varies with time. What is the frequency and the maximum value of the e.m.f?

	Frequency / Hz	Maximum e.m.f. / V
(a)	200	2.0
(b)	200	4.0
(c)	400	2.0
(d)	400	4.0

(100) The armature of a generator consists of a flat square coil of side 4 cm and 200 turns. The coil rotates in a magnetic field of 0.75T. The angular speed so that a maximum emf of 1.6V is generated is _____

(a) $\frac{20}{3}\,\text{rad}\,\text{s}^{-1}$ **(b)** $\frac{20}{3}$ rotations/s

(c) $\frac{20}{3}$ rpm **(d)** None

Topic 15.9 to 15.12:

D.C Generator, Back Motor Effect in Generators,
D.C Motor, Back EMF Effect in Motors

(101) What in a D.C motor, reverses the direction of current through the coil every half cycle.
(a) The armature **(b)** The brushes
(c) The Commutator **(d)** The slip rings

(102) A device for converting electrical energy into mechanical energy is know as
(a) Motor **(b)** Transformer
(c) Dynamos **(d)** None of the above.

(103) The magnitude of back emf, when motor is over loaded
(a) increase **(b)** decrease
(c) remain same **(d)** become zero

(104) The brushes used in motor is made of
(a) carbon **(b)** steel
(c) iron **(d)** copper

(105) The difference between A.C generators and D.C motors in construction is that
(a) slip rings **(b)** magnetic field
(c) carbon brushes **(d)** Commutator

(106) A generator running in reverse is called
(a) transformer **(b)** galvanometer
(c) rectifier **(d)** motor

(107) Back emf of motor depends on
(a) resistance **(b)** angular velocity
(c) both a & b **(d)** none of these

(108) When motor started then back emf is

(a) at its peak value **(b)** high
(c) almost zero **(d)** none of these

(109) Motor is a device which converts the electric energy into
(a) mechanical energy **(b)** chemical energy
(c) light energy **(d)** heat energy

(110) A dynamo converts
(a) electrical energy into mechanical energy **(b)** mechanical energy into electrical energy
(c) magnetic energy into electrical energy **(d)** heat energy into electrical energy

(111) For electroplating we use
(a) D.C source **(b)** A.C source
(c) both a and b **(d)** none of these

(112) The component which is mainly used in D.C generators is
(a) slip rings **(b)** resistor
(c) inductor **(d)** Commutator

(113) The magnetic field in the motor can be provided by
(a) electromagnet **(b)** permanent magnet
(c) both a and b **(d)** none of these

(114) In D.C motor, if the current in the coil were all the time in the same direction, the torque on it would be reversed after each
(a) complete revolution **(b)** half revolution
(c) quarter revolution **(d)** none of these

(115) Which of the following is not present in the D.C generator
(a) armature **(b)** permanent magnet
(c) slip rings **(d)** Commutator

(116) The most common source of A.C voltage is
(a) motor **(b)** cell
(c) generator **(d)** Transformer

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(117) Which device permits the flow of D.C.? RWP-2019 (G-I)
(a) Capacitor **(b)** Photocell
(c) Inductor **(d)** Transformer

(118) When the motor is just started, its back emf is SGD-2022 (G-I)
(a) maximum **(b)** minimum
(c) almost zero **(d)** equal to current

(119) The jerks in D.C. motor are created by the use of DGK-2017 (G-I)
(a) armature **(b)** commutators
(c) slip rings **(d)** source of emf

(120) If the Motor is overloaded, then magnitude of back emf. BWP-2019 (G-II)
(a) Increases **(b)** Decreases
(c) Remains constant **(d)** Becomes zero

(121) The only difference between the construction of A.C. and D.C. generator is: MTN-2019 (G-II)
(a) Carbon Brushes **(b)** Commutator
(c) Coil **(d)** Magnetic field

(122) A device which converts electrical energy into mechanical energy is. BWP-2022 (G-I)
(a) Transformer **(b)** D.C. motor
(c) A.C. Generator **(d)** D.C. Generator

(123) In D.C generator split ring act as BWP-2022 (G-II)
(a) Capacitor **(b)** Commutator
(c) Inductor **(d)** Resistor

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(124) The back-emf of a motor when it is just started

(a) 0 **(b)** Remains same
(c) Maximum **(d)** None of these

(125) The coil of D.C motor is connected with

(a) A.C supply **(b)** D.C supply
(c) Slip rings **(d)** Split rings

Topic 15.13:

Transformer

(126) Transformers work on the principle of

(a) self induction **(b)** electrostatic induction
(c) mutual induction **(d)** none of these

(127) A device which is used to increase or decrease the value of alternating voltage is called

(a) A.C generator **(b)** D.C motor
(c) A.C motor **(d)** Transformer

(128) The equation for the transformer is given by

(a) $\frac{N_s}{N_p} = \frac{V_s}{V_p}$ **(b)** $\frac{N_p}{Ns} = \frac{V_s}{V_p}$

(c) $\frac{N_s}{N_p} = \frac{I_p}{I_s}$ **(d)** both a & c

(129) For an ideal transformer

(a) power input = power output **(b)** power input < power output
(c) power input > power output **(d)** none of these

(130) The efficiency of a transformer is given by

(a) $\text{efficiency} = \frac{\text{Input power}}{\text{Output power}} \times 100$

(b) $\text{efficiency} = \frac{\text{Output power}}{\text{Input power}} \times 100$

(c) $\text{efficiency} = \text{Input power} \times \text{Output power} \times 100$

(d) $\text{efficiency} = \frac{\text{Output power}}{\text{Input power}} \times \frac{1}{100}$

(131) Transformers for domestic use step down the voltage to

(a) 220V **(b)** 250V
(c) 440V **(d)** 120V

(132) The loss of power in transformers can be reduced by

(a) using laminated sheets of a core material
(b) decreasing the resistance of the coils
(c) proper coupling of primary and secondary coils
(d) all of these

(133) In step down transformer

(a) $N_p > N_s$ **(b)** $N_p < N_s$
(c) $N_p = N_s$ **(d)** none of these

(134) Transformers work on

(a) A.C **(b)** D.C

(c) both a and b **(d)** none of these

(135) To enhance the magnetic flux the primary and secondary coils of the transformer are wound on

(a) aluminium **(b)** iron core

(c) soft iron core **(d)** steel

(136) The transformer in which voltage across secondary is less than the primary voltage is called

(a) step down transformer **(b)** step up transformer

(c) Ideal transformer **(d)** none of these

PAST PAPER MCQS

(137) Working principle of transformer is: LHR-2017 (G-I)

(a) self induction **(b)** faraday's law

(c) mutual induction **(d)** electromagnetic induction

(138) Efficiency of transformer is not affected by: RWP-2016 (G-I)

(a) input voltage **(b)** core of transformer

(c) insulation between sheets **(d)** resistance of coils

(139) For step down transformer; SWL-2017, MIRPUR (AJK) 2017

(a) $N_S < N_P$ **(b)** $N_S > N_P$

(c) $N_S = N_P$ **(d)** $N_S >>> N_P$

(140) Transformer works on principle of SGD-2017 (G-II)

(a) mutual induction **(b)** self induction

(c) electrostatic **(d)** both mutual and self induction

(141) For an ideal step up transformer: RWP-2019 (G-I)

(a) $N_p > N_s$ **(b)** $V_sI_s > V_pI_p$

(c) $V_s < V_p$ **(d)** $I_s < I_p$

(142) "Eddy current" are set up in a direction. SGD-2022 (G-II)

(a) parallel to flux **(b)** antiparallel to flux

(c) at 45° to flux **(d)** perpendicular to flux

(143) Transformer is an Electrical Device used to change: BWP-2019 (G-II)

(a) Alternating Current **(b)** Direct Current

(c) Alternating emf **(d)** Voltage

(144) The common doorbell requires a voltage of about. MTN-2022 (G-I)

(a) 7 V **(b)** 6V

(c) 9 V **(d)** 10V

(145) The principle of transformer is. MTN-2022 (G-II)

(a) conservation of energy **(b)** conservation of charge

(c) momentum conservation **(d)** mutual induction

(146) If step up transformer 100% efficient, the primary and secondary windings would have the same. DGK-2022 (G-II)

(a) Current **(b)** Power

(c) Voltage **(d)** Direction of winding

ENTRY TEST MCQS

(147) The transformer is used to light a 100 W and 220 V lamp from 220 V mains. If the main current is 0.5 amp, the efficiency of the transformer is

(a) 11% **(b)** 55%

(c) 50% **(d)** 90%

(148) In a step-up transformer the turn ratio is 1:2. A Lechlanche cell (emf = 1.5 V) is connected across the primary. The voltage across the secondary is:

(a) 3 V **(b)** 0.75 V

(c) 1.5 V **(d)** Zero

(149) Frictional losses in transformer are:

(a) 0% **(b)** 2%

(c) 10% **(d)** 25%

ANSWER KEYS

(Topical Multiple Choice Questions)

1	B	21	C	41	C	61	D	81	B	101	C	121	B	141	D
2	D	22	A	42	A	62	D	82	D	102	A	122	B	142	D
3	B	23	D	43	C	63	B	83	B	103	B	123	B	143	C
4	C	24	B	44	A	64	D	84	B	104	A	124	A	144	C
5	B	25	D	45	C	65	B	85	A	105	D	125	D	145	D
6	C	26	B	46	D	66	B	86	A	106	D	126	C	146	B
7	D	27	A	47	D	67	B	87	D	107	B	127	D	147	D
8	B	28	C	48	B	68	A	88	A	108	C	128	D	148	D
9	A	29	A	49	B	69	A	89	C	109	A	129	A	149	A
10	C	30	A	50	B	70	D	90	D	110	B	130	B		
11	C	31	A	51	A	71	A	91	B	111	A	131	A		
12	C	32	C	52	A	72	B	92	D	112	D	132	D		
13	A	33	C	53	A	73	B	93	C	113	C	133	A		
14	D	34	B	54	A	74	B	94	D	114	B	134	A		
15	B	35	B	55	A	75	B	95	B	115	C	135	B		
16	D	36	C	56	D	76	A	96	A	116	C	136	A		
17	B	37	C	57	D	77	B	97	A	117	C	137	C		
18	C	38	C	58	C	78	B	98	B	118	C	138	A		
19	C	39	C	59	B	79	A	99	A	119	B	139	A		
20	D	40	B	60	D	80	A	100	A	120	B	140	A		

KIPS TOPICAL SHORT QUESTIONS

15.1 INDUCED EMF AND INDUCED CURRENT

(1) In how many ways, voltages can be induced in a wire?

Ans: **(i)** Coil in motion, magnet at rest
(ii) By changing current in coil produces voltages in neighbouring coil
(iii) By moving the magnet near the wire

(2) Define induce current and induce e.m.f How the magnitude of this current can be increased.

Ans: When a conductor is moved in a magnetic field, the e.m.f is established across the conductor. This e.m.f is called induced e.m.f. The current flowing through the closed conductor due to this e.m.f is called induced current, the magnitude of this current can be increased by
(i) Using a stronger magnetic field.
(ii) Moving the loop faster.
(iii) Using the coil having large number of turns.

(3) Define induced emf and induced current. SWL-2015

Ans: When a loop of wire is moved across a magnetic field, an emf produce in a loop which is called induced emf.

$$\frac{\Delta\phi}{\Delta t} = \text{constant}$$

This constant is called induced emf. The current produced due to induced emf is called induced current.

(4) Name four methods to produce induce emf.

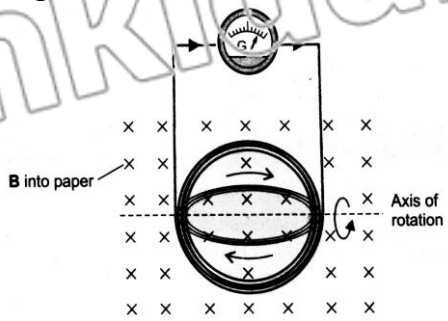
Ans: Name of the methods to produce induce emf:
Induced emf is produced
(i) When a bar magnet is placed near a loop containing coil and galvanometer.
(ii) By changing the area of the coil in a uniform magnetic field.

(iii) By rotating coil in magnetic field. (Principle of A.C generator)
(iv) When a coil placed in the magnetic field of electromagnet.

(5) Write two methods to change flux for electromagnetic induction. LHR-2014

Ans: Method 1

An induced current can also be generated by rotating coil in magnetic field. This is the basic principle of electric generator



Method 2

In Fig (a), coil 'P' in the battery circuit is called primary coil and 'S' in the galvanometer circuit is called secondary coil. When the switch is closed current increases from 0 to maximum in P coil as shown in figure (b). Due to varying current, magnetic flux of P linking with S changes and induced current is produced as shown by galvanometer. Galvanometer shows no deflection when current in P coil becomes steady. Current in P coil can also be changed by using the rheostat.

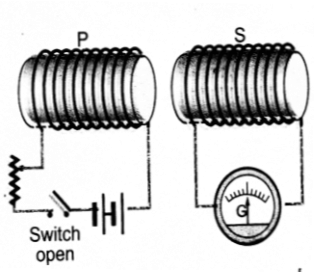


Figure (a)

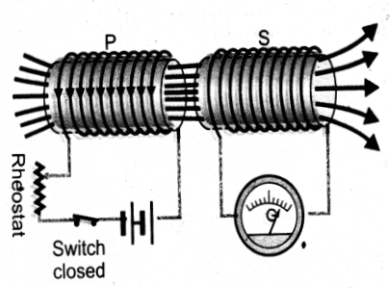


Figure (b)

(6) Write down any one method used for the production of induced e.m.f. SGD-2013

Ans: Relative motion changes the magnetic flux through the loop. This change in flux induces an emf. Greater the rate of change of flux, the larger is the induced emf. Hence relative motion between the loop and magnet causes induced emf.

(7) Can an electron at rest be set in motion with a magnet? Explain. SGD-2016 (G-II)

Ans: No, an electron at rest be set in motion with a magnet because magnetic force act on a moving charge.

By using that relation:

$$\bar{F} = q(\bar{v} \times \bar{B})$$

$$\bar{F} = qvB\sin\theta$$

As $v = 0$

$\Rightarrow$ $F = 0$

Magnetic force is a non-accelerating force.

(8) Define electromagnetic induction. MIRPUR (AJK) 2017

Ans: Michael Faraday showed that an electric current could be produced in a conductor under the influence of a varying magnetic field. This phenomenon is called electromagnetic induction and the current produced in this way is termed as induced current.

PAST PAPER SHORT QUESTIONS

(9) Define electromagnetic induction. **MIRPUR (AJK) 2017**

(10) Does the induced emf in a circuit depend on the resistance of the circuit? **MIRPUR (AJK) 2017**

(11) Name four methods to produce induced emf. **BWP-2017 (G-I)**

(12) Write two methods in which current is induced in coils. **MTN-2019 (G-II), GRW-2022 (G-II)**

(13) Define induced current and induced emf. **BWP-2019 (G-II)**

15.2 MOTIONAL EMF

(14) What is motional emf? Give its formula.

Ans: The emf induced by the motion of a conductor across a magnetic field is called motional emf.

$$\varepsilon = -vBL$$

(15) A metal rod of length 25cm is moving at a speed of 0.5ms^{-1} in a direction perpendicular to a 0.25T magnetic field. Find the emf produced in the rod. **GRW-2019 (G-I)**

Length = L = 25 cm = 0.25m

Speed = V = 0.5 m/s

Magnetic field strength= B = 0.25 T

$$\varepsilon = vBL$$
$$= 0.5\times0.25\times0.25$$
$$= 0.03125 \text{ volt}$$

(16) Show that the terms ε and vBL have same units. **FSD-2012**

Ans: As unit of ε is $JC^{-1} = v$

and $= vBL$

$= ms^{-1} (NA^{-1}m^{-1}) m$

$= \frac{Nm}{As}$

$= JC^{-1}$

$= v$

So, units of ε and vBL is volt.

(17) What is motional emf? State the factors it depends upon. **RWP-2019 (G-I)**

Ans: The emf induced by the motion of a conductor across a magnetic field is called motional emf.

Factors:

(i) Length of the rod

(ii) Strength of external magnetic field

(iii) Speed of the rod

(iv) Angle between velocity and magnetic field

PAST PAPER SHORT QUESTIONS

(18) A metal rod of length 25cm is moving at a speed of 0.5ms^{-1} in a direction perpendicular to a 0.25T magnetic field. Find the emf produced in the rod. **GRW-2019 (G-I)**

(19) Define motional emf and write its formula. **MIRPUR (AJK) 2017, DGK-2022 (G-I)**

(20) What is motional emf? State the factors it depends upon. **BWP-2019 (G-I)**

(21) A metal rod of 0.25m is moving at a speed of 0.5 ms^{-1} in a direction perpendicular to a 0.25T magnetic field. Find emf produced in the rod. **BWP-2022 (G-I)**

15.3 FARADAY'S LAW AND INDUCED EMF

(22) **State Faraday's law and Lenz's law.**

Ans: **Faraday's law:** The average emf induced in a conducting coil of N loops is equal to the negative of the rate at which the magnetic flux through the coil is changing with time. Mathematically Faraday's law can be written as:

$$\varepsilon = -N\frac{\Delta\phi}{\Delta t}$$

Lenz's law: The direction of the induced current is always so as to oppose the change which causes the current.

PAST PAPER SHORT QUESTIONS

(23) State Faraday's law of electromagnetic induction and also write its expression.
SWL-2019, LHR-2013, 2019 (G-II), LHR-2022 (G-I), MTN 2022 (G-I)

(24) In a transformer there is no transfer of charge from primary to secondary coil. How is then the power transfered? **LHR-2016 (G-I), 2019 (G-II)**

(25) What is the importance of minus sign in the expression $\left(\varepsilon = -N\frac{\Delta\phi}{\Delta t}\right)$ for Faraday's law of electromagnetic induction? **LHR-2021 (G-I)**

(26) Does the induced emf always act to decrease the magnetic flux through a circuit?
LHR-2021 (G-I, II)

(27) How an emf is induced in a coil of wire using a bar magnet? **LHR-2021 (G-II)**

(28) A square loop of wire is moving through a uniform magnetic field. The normal to the loop is oriented parallel to the magnetic field. Is an emf induced in the loop? Give a reason for your answer. **MIRPUR (AJK) 2017 DGK-2017 (G-II)**

(29) How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop?
SWL-2017, LHR-2022 (G-II), BWP-2022 (G-I), BWP-2022 (G-I)

(30) Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop? Explain briefly
DGK-2017 (G-I), LHR-2021 (G-I)

(31) Show that emf and $\frac{\Delta\phi}{\Delta t}$ have the same units. Or Show that induced emf and rate of change of flux has the same unit. **DGK-2017 (G-II) , SWL-2017, SGD-2017 (G-II), LHR-2017 (G-I), LHR-2021 (G-II), LHR-2022 (G-I), BWP-2022 (G-I)**

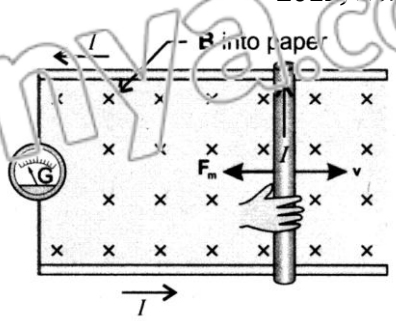
(32) Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit?
GRW-2022 (G-I), DGK-2022 (G-I), DGK-2022 (G-II)

(33) Explain the factor responsible for power loss in transistor. **DGK-2022 (G-I)**

15.4 LENZ'S LAW

(34) How does Lenz's law explain law of conservation of energy during phenomenon of electromagnetic induction? **2012, 2013**

Ans: **(i)** Lenz's Law is also the statement of law of conservation of energy. In the fig when rod is moved towards right, induced current is flowing in the loop in anticlockwise direction. We know that the force on a current carrying conductor is $F = BIL$.



(ii) According to the right hand rule direction of $\vec{F}_m$ is opposite to $\vec{v}$. An external force is equal and opposite to $\vec{F}_m$ must be applied. This pulling force gives the energy for induced current to flow. This energy is the source of induced current. Thus electromagnetic induction is according to the law of conservation of energy.

PAST PAPER SHORT QUESTIONS

(35) State Lenz's law and write its formula. **GRW-2019 (G-I)**

(36) A light metallic ring is released from above into a vertical bar magnet with south pole to the upside. Does the current flow clockwise or anticlockwise in the ring? **DGK-2017 (G-I)**

(37) Does the induced emf always act to decrease the magnetic flux through a circuit?
GRW-2022 (G-I), MTN-2022 (G-I), RWP-2022 (G-I), RWP-2022 (G-II)

(38) A suspended magnet is oscillating freely in a horizontal plane. The oscillation are strongly damped when a metal plate is placed under the magnet. Explain why does this occur? **BWP-2022 (G-II)**

15.5 MUTUAL INDUCTION

(39) Differentiate between mutual induction and mutual inductance.

Ans: **Mutual Induction:**

(i) The phenomenon in which a changing current in one coil induces an emf in another coil is called mutual induction.

(ii) It is a process of induction

Mutual Inductance:

(i) It is defined as the ratio of average emf induced in the secondary to the time rate of change of current in the primary.

(ii) It is the constant of proportionality. Its unit is Henry.

(40) Using the relation for mutual inductance, show that S.I unit of mutual inductance is VsA^{-1}. What is the common name of this unit?

Ans: Relation for Mutual Inductance M is $M = \frac{\varepsilon_s}{\Delta I_p / \Delta t}$.

$$M = \frac{E_s}{\Delta I_p / \Delta t}$$

So S.I unit of mutual inductance is

$$\frac{V}{(A/s)} = V \times \frac{s}{A}$$

$$\Rightarrow \quad V.A^{-1}s$$

(41) Define Henry.

Ans: It is a unit of inductance defined separately for self-inductance and mutual inductance as follows:

"Self inductance of a coil is called one hennery if induced emf of One volt is produced in it when current through it is changing at the rate of one ampere per second.

i.e. $1H = 1VA^{-1}s$

And

"Mutual inductance of a pair of coils is said to be one henry if induced emf of one volt is produced is secondary when current in primary coil is changing at the rate of one ampere per second."

i.e. $1 H = 1 VA^{-1}s$

Common name: Common name for $VA^{-1}s$ is henry denoted by the symbol "H".

$\therefore H = VA^{-1} s$

(42) What are the dimensions of mutual inductance?

Ans: The S.I unit of mutual inductance = $VsA^{-1} = \frac{J}{C} s A^{-1}$

$$= \frac{kg\, m^2 s^{-2}}{As} sA^{-1}$$

$$= kg\, m^2 s^{-2} A^{-2}$$

So, The dimension of mutual inductance = $[ML^2T^{-2}A^{-2}]$

(43) Write down four factors on which mutual inductance depends. LHR-2016 (G-II)

Ans: It depends upon the following

(i) Number of the turns of the coils.
(ii) Area of cross section of coil.
(iii) Closeness of loops.
(iv) Nature of core materials.

PAST PAPER SHORT QUESTIONS

(44) If number of turns in a solenoid is doubled, keeping the other factors constant, how does the self-inductance change? **LHR-2017 (G-I)**

(45) What are the dimensions of mutual inductance? **LHR-2017 (G-I)**

(46) Define mutual inductance of the coils and also define its unit henry.
LHR-2019 (G-II), BWP-2019 (G-II)

(47) What are factors on which mutual inductance depends?
SGD-2017 (G-I), FSD-2019 (G-I), LHR-2022 (G-II)

15.6 SELF INDUCTION

(48) Define self inductance, on which factors does it depend.

Ans: Self inductance L, is defined as the ratio of the induced e.m.f to the rate of change of current in the same coil.

It depends upon

(i) The number of turns of the coil.
(ii) The cross-sectional area of coil.
(iii) The core material.

Its equations given as $L = m_o n^2 Al$

(49) What is back emf

Ans: Mathematically, self induced emf can be written as:

$$\varepsilon_\ell = -L\frac{\Delta I}{\Delta t}$$

-ive sign indicates that the self induced emf opposes the change that produced it that is why ε_ℓ is sometimes called back emf

PAST PAPER SHORT QUESTIONS

(50) Why self induced emf is also called as back emf? **LHR-2021 (G-I, II)**

(51) Define the term henry. Write henry in SI units. **SWL-2019**

(52) Define self inductance and its unit. **PWP-2017 (G-I), MTN 2022 (G-II)**

(53) On what factors the self inductance of a coil depends? Explain briefly. **DGK-2022 (G-II)**

15.7 ENERGY STORED IN AN INDUCTOR

(54) What are/is the use of Inductors in A.C circuit?

Ans: They behave like resistors because when current increases, the inductor opposes it and decreases it to a required level.

15.8 ALTERNATING CURRENT GENERATOR

(55) How the fluctuations of the output in D.C. generator is reduced.

Ans: The fluctuations can be reduced by using more than one coil. These multiple coils are wounded around a cylindrical core to form an armature. Each coil have separate Commutator and the output of every coil is obtained only when it reaches to its peak emf. Thus almost constant e.m.f is obtained in the outer circuit.

(56) Will the output voltage of a generator changes if its speed of rotation is increased?

Ans: Yes, the output of a generator will change if its speed of rotation is increased according to the following relations:

$$I = \frac{\varepsilon}{R} \ldots (i)$$

As $\varepsilon = N\omega AB \sin(\omega t)$

So eq. (i) becomes

$$\& \qquad I = \frac{N\omega AB}{R}\sin(\omega t)$$

Here "ω" is the speed of rotation. If the speed of rotation of generator increases then its output voltage also increases and vice-versa.

(57) Considering induced emf produced by A.C generator of loop resistance R, correlate the instantaneous emf and max. emf. Also instantaneous current and max. current **DGK-2017 (G-II)**

Ans: The relation between instantaneous emf and maximum emf is

$$\varepsilon = \varepsilon_0 \sin 2\pi ft$$

Relation between instantaneous current and max. current

$$I = I_0 \sin 2\pi ft$$

(58) Distinguish between slip rings and split rings. **LHR-2016 (G-II)**

Ans: Commutator is a split ring of copper placed on the armature of the DC machine to provide connection from external circuit to armature. It acts as a mechanical rectifier to the armature induced voltage or current.

Slip ring is a continuous thin ring of copper used to provide the DC supply to the rotor windings in an alternator or single phase AC generator. For the two separate terminals,

two separate rings are generally used. Slip rings directly tap the AC power from AC generator or send DC power to the field winding of rotor of the alternator.

(59) What are factors on which maximum value of emf induced across terminals of armature of an A.C generator depend? FSD-2013

Ans: According to the relation of maximum value of emf induced across terminals of armature of A.C. generator depends upon $\varepsilon_0 = N\omega AB$

(i) No. of turns of the coil
(ii) Rotating speed of the coil
(iii) Area of the coil
(iv) Strength of external magnetic field

PAST PAPER SHORT QUESTIONS

(60) Considering induced emf produced by A.C generator of loop resistance R, co-relate the instantaneous emf and maximum emf. Also instantaneous current and maximum current **DGK-2017 (G-II)**

15.9 D.C. GENERATOR

(61) How does the construction of a DC generator differ from an AC generator?

Ans: The difference between AC generator and DC generator is that in case of DC generator, split rings are used but in case of AC generator, slip rings are used instead of split rings. Both are used as output terminals of the generator through carbon brushes.

(62) Define D.C. Generator and D.C. Motor.

Ans: **D.C Generator:** It is an electrical device which converts mechanical energy into electrical energy in the form of D.C current.

D.C Motor: It is an electrical device which converts D.C form of electric current into mechanical energy.

(63) Does the output voltage of a generator change if its speed of rotation is increased? Explain briefly. (LHR 2013)

Ans: According to this relation $\varepsilon = N\omega AB$ output voltage of a generator is directly relate with its rotating speed. So, by increasing speed of rotation output of a generator also increase.

PAST PAPER SHORT QUESTIONS

(64) If number of turns in a solenoid is doubled, keeping the other factors constant, how does the self-inductance change? **LHR-2017 (G-I)**

(65) Can a D.C motor be turned into a D.C generator? What changes are required to be done? **SWL-2017**

(66) Can an electric motor be used to derive an electric generator with the output from the generator being used to operate the motor? Explain **BWP-2017 (G-I)**

(67) Distinguish between slip rings and split rings. **MTN-2022 (G-II)**

(68) How fluctuations of output can be reduced in D.C generator? **RWP-2022 (G-II)**

15.10 BACK MOTOR EFFECT IN GENERATORS

(69) What is back motor effect in generators?

Ans: In generator, coil is rotated by some external means in a magnetic field and current is induced in the coil. Now the magnetic field of magnet exerts equal and opposite forces on two sides of the current carrying coil. These forces produce a counter torque that opposes the rotational motion of the coil. This effect is called back motor effect in generators.

PAST PAPER SHORT QUESTIONS

(70) If number of turns in a solenoid is doubled, keeping the other factors constant, how does the self-inductance change? **LHR-2017 (G-I)**

(71) What is back motor effect in generators? **FSD-2019 (G-I)**

15.11 D.C. MOTOR

(72) Give the parts and working principle of D.C. motor.

Ans: **Principle:-** When current flows through a coil which is placed in a magnetic field, the turning effect is produced in the coil, which is given by the equation; $\tau = NIAB\,Cos\theta$. Thus coil rotates due to this torque.

Parts:- It contains the same parts as that of D.C. generator.

a) Field magnet b) Armature c) Split rings
c) Carbon brushes d) D.C source f) commutator

(73) Differentiate between motor and generator. **RWP-2013**

Ans:

Motor	Generator
(i) Motor is a device which converts electrical energy into mechanical energy.	**(i)** Generator is a device which converts mechanical energy into electrical energy.
(ii) The shaft of the motor is driven by magnetic force developed between armature and field windings.	**(ii)** The shaft of the generator is attached to the rotor and is driven by mechanical force.

(74) Why does a motor draw more current when it is overloaded? **SWL-2013**

Ans: When motor is overloaded then value of induced current is greater and the greater will be the value of opposite torque. In order to overcome it, large amount of mechanical energy is supplied to keep smooth running of generator.

PAST PAPER SHORT QUESTIONS

(75) Can an electric motor be used to drive an electric generator with output from the generator being used to operate the motor?

LHR-2017 (G-I), LHR-2022 (G-I), GRW-2022 (G-I), RWP-2022 (G-I)

(76) What is function of the commutator in D.C motor? **GRW-2019 (G-II)**

(77) Can a D.C motor be turned into D.C generator? What changes are required to be done?

SGD-2017 (G-I) & (G-II), MTN-2022 (G-I), MTN 2022 (G-II), RWP-2022 (G-II)

(78) When an electric motor such as an electric drill is being used, does it also act as a generator? If so what is the consequence of this? **BWP-2022 (G-I)**

15.12 BACK E.M.F EFFECT IN MOTORS

(79) What is back emf in a motor, if it is just started? What is back EMF, when motors speeds up?

Ans: In the start, back emf will be zero. So a large current flows through it.
When motor speeds up, back emf also increases. Hence current decreases.

(80) What do you mean by back emf effect in a motor? **LHR-2012**

Ans: When coil of motor rotates between poles, flux changes and induced e.m.f is produced across the coil which opposes the rotation of coil. This induced e.m.f is called back e.m.f of motor and it depends upon the speed of motor. This effect is known as back emf in motors.

PAST PAPER SHORT QUESTIONS

(81) What is back emf effect in motors? **RWP-2019 (G-I), MTN-2019 (G-I), LHR-2022 (G-I)**

(82) Why the motor is overloaded? Give the reason. **MTN-2019 (G-II)**

(83) What is meant by back motor effect in generator? **GRW 2022 (G-II)**

15.13 TRANSFORMER

(84) Can an efficient transformer step up energy? Briefly explain?

Ans: In a efficient transformer

Power Input = Power Output

Hence, power remains the same, so transformer cannot step up the energy.

(85) How is the efficiency of transformer increased?

Ans: The efficiency of the transformer is defined as

$$\text{Efficiency} = \frac{\text{output power}}{\text{Input power}} \times 100$$

The efficiency of a transformer can be increased by reducing the power losses. It can be done by taking the following steps.

(i) Loop Area:

Core is assembled from the laminated sheets of a material whose hysteresis loop area is very small.

(ii) Insulation:

The insulation between the sheets of core should be perfect to stop eddy currents.

(iii) Resistance of primary and secondary coils:

The material of wires of primary and secondary coils must be such that their electrical resistance is very small as may ‘be possible.

(iv) Flux Coupling:

Primary and secondary coils should be wound in such a way that flux coupling between them is maximum.

(86) What are two major power losses in Transformer?

Ans: Two major power losses in transformer are

(i) Power loss due to “Eddy currents”

(ii) Power loss due to Hysteresis, which is the energy expended in magnetizing and demagnetizing the core material in each cycle of A.C.

(87) What is working principle of a transformer? Explain it. **SGD-2013**

Ans: It is based upon the principle of electromagnetic induction (mutual induction) i.e. an e.m.f. is induced in a circuit due to a current changing in a neighbouring circuit.

(88) Distinguish between AC generator and transformer. **FSD-2016 (G-I)**

Ans:

AC GENERATOR	Transformer

(i) It is a device which converts mechanical energy into electrical energy in the form of alternating current. **(ii)** It is based upon the principle that if magnetic flux linked with a coil changes an e.m.f is induced in it.	**(i)** A transformer is a device for converting the low A.C voltage to high A.C voltage and vice versa. **(ii)** It is based upon the principle of electromagnetic induction (mutual induction) i.e. an emf is induced in the circuit due to a current changing in a neighbouring circuit.

(89) What do you mean by eddy current? RWP-2016 (G-I)

Ans: As magnetic flux changes through a solid conductor, induced currents are set up in closed paths in the body of the conductor. These induced currents are set up in a direction perpendicular to the flux and are known as eddy currents. It results in power dissipation and heating of the core material.

(90) Define step up and step down transformers. DGK 2015 (G-II)

Ans: Step up Transformer

If $N_s > N_p$ then $V_s > V_P$

A transformer in which voltage across secondary is greater than that against primary is called step up transformer.

Step Down Transformer

If $N_s < N_p$

Then $V_s < V_p$

A transformer in which voltage across secondary is less than that against primary is called step down transformer

(91) Why transformers are used in the A.C supply network? SWL-2016

Ans: A transformer is a device for converting the low A.C voltage to high A.C voltage and vice versa.

Transformer doesnot work on D.C supply because polarity of D.C does not change. So, there is no flux change occur and no current generate.

That why transfomers are used only in the A.C supply network.

PAST PAPER SHORT QUESTIONS

(92) In a transformer, there is no transfer of charge from the primary to the secondary coil, how is then the power transferred. **DGK-2017 (G-I), SGD-2017 (G-I)**

(93) Can a step-up transformer increase the power level? Comment.
SWL-2017, DGK-2017 (G-I), LHR-2022 (G-II)

(94) What is transformer? What is its working principle? **MTN-2019 (G-I)**

(95) Distinguish A.C. generator and transformer. **LHR-2022 (G-II)**

(96) How the power losses in a transformer can be minimized? **GRW-2022 (G-I)**

(97) Four unmarked wires emerge from a transformer. What steps would you take to determine the turns ratio?
GRW-2022 (G-II), MTN 2022 (G-II), DGK-2022 (G-I), DGK-2022 (G-II)

(98) Who can we improve the efficiency of a transformer? **MTN-2022 (G-I), DGK-2022 (G-II)**

(99) When the primary of a transformer is connected to the A.C. mains, the current in it. **(a)** Is very small if the secondary circuit is open, but **(b)** Increase when the secondary circuit is closed. Explain these facts. **BWP-2022 (G-I)**

(100) Describe practical use of step up Transformer **BWP-2022 (G-I)**

(101) Can a step-up transformer increase the power level? Explain with equation?
BWP-2022 (G-II), RWP-2022 (G-I)

(102) What is meant by efficiency of transformer? Write few steps to improve the efficiency.
RWP-2022 (G-II)