



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## ELECTRICAL AND ELECTRONICS ENGINEERING

### DEFINITIONS AND TERMINOLOGY QUESTION BANK

<b>Course Name</b>	:	<b>ELECTRICAL MACHINES - I</b>
<b>Course Code</b>	:	<b>AEEB11</b>
<b>Program</b>	:	<b>B.Tech</b>
<b>Semester</b>	:	<b>III</b>
<b>Branch</b>	:	<b>Electrical and Electronics Engineering</b>
<b>Section</b>	:	<b>A &amp; B</b>
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<b>Course Faculty</b>	:	<b>Mr. K Devender Reddy, Assistant Professor Dr. P Sridhar, Professor</b>

#### OBJECTIVES:

I	Understand the concepts of magnetic circuits and illustrate the theory of electromechanical energy conversion and the concept of co-energy
II	Understand the operation of dc machines
III	Analyze the differences in operation of different dc machine configurations
IV	Analyze single phase and three phase transformers circuits

#### DEFINITIONS AND TERMINOLOGY QUESTION BANK:

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
<b>MODULE- I</b>						
1	Define Magnetomotive Force?	The current flowing in an electric circuit is due to the existence of electromotive force similarly magnetomotive force (MMF) is required to drive the magnetic flux in the magnetic circuit. The magnetic pressure, which sets up the magnetic flux in a magnetic circuit is called Magnetomotive Force. The SI unit of MMF is Ampere-turn (AT), and their CGS unit is G (gilbert).	Remember	CO1	CLO1	AEEB11.01
2	Define magnetic flux.	Magnetic flux is a measurement of the total magnetic lines of force which passes through a given area	Remember	CO1	CLO1	AEEB11.01
3	Define magnetic flux density.	The flux per unit area is called as magnetic flux density.	Understand	CO1	CLO1	AEEB11.01
4	What is the unit of magnetic field?	Magnetic Field Units. A smaller magnetic field unit is the Gauss (1 Tesla = 10,000 Gauss). The magnetic quantity B which is being called "magnetic field" here is sometimes called "magnetic flux density". An older unit name for the Tesla is Webers per meter squared, with the Weber being the unit of magnetic flux.	Remember	CO1	CLO1	AEEB11.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
5	What is difference between magnetic field and magnetic flux?	Difference Between Magnetic Field & Magnetic Flux. The most significant difference between the magnetic field and the magnetic flux is that the magnetic field is the region around the magnet where the moving charge experiences a force, whereas the magnetic flux shows the quantity or strength of magnetic lines produced by the magnet.	Understand	CO1	CLO1	AEEB11.01
6	Describe magnetic reluctance.	The obstruction offered by a magnetic circuit to the magnetic flux is known as reluctance. As in electric circuit, there is resistance similarly in the magnetic circuit, there is a reluctance, but resistance in an electrical circuit dissipates the electric energy and the reluctance in magnetic circuit stores the magnetic energy. Also in an electric circuit, the electric field provides the least resistance path to the electric current. Similarly, the magnetic field causes the least reluctance path for the magnetic flux. It is denoted by S.	Understand	CO1	CLO1	AEEB11.01
7	What is a magnetic energy?	Magnetic energy is the energy within a magnetic field. This energy results in various metals either repelling or attracting each other.	Understand	CO1	CLO1	AEEB11.01
8	Define mutual induction?	mutual induction. The production of an electromotive force in a circuit resulting from a change of current in a neighboring circuit. n. (General Physics) the production of an electromotive force in a circuit by a current change in a second circuit magnetically linked to the first.	Understand	CO1	CLO1	AEEB11.01
9	Explain the difference between inductor and inductance.	Difference Between Capacitor and Inductor. Inductor is simply a coil and it stores energy as a magnetic field when an electric current passing through it. Inductance is a measure of an inductor's capability to store energy. Inductance is measured in unit Henry (H). When an alternative current is passing through an inductor.	Understand	CO1	CLO1	AEEB11.01
10	Define self induction?	Self-inductance is a specific form of electromagnetic induction. It is defined as induction of a voltage in a current carrying wire when the current in the wire itself changing. The magnetic field created by a changing current in the circuit itself induces a voltage in the same circuit.	Remember	CO1	CLO1	AEEB11.01
11	Describe the magnetic permeability of iron.	Magnetic permeability. A ferromagnetic material, such as iron, does not have a constant relative permeability. As the magnetizing field increases, the relative permeability increases, reaches a maximum, and then decreases. Purified iron and many magnetic alloys have	Understand	CO1	CLO3	AEEB11.03

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		maximum relative permeabilities of 100,000 or more				
12	What is the meaning of energy?	Energy is defined as the capacity of a physical system to perform work. However, it's important to keep in mind that just because energy exists, that doesn't mean it's necessarily available to do work.	Remember	CO1	CLO3	AEEB11.03
13	Define stored energy?	Stored energy, or potential energy, is the amount of energy an object has due to its position in space.	Remember	CO1	CLO3	AEEB11.03
14	What is electric permittivity?	Permittivity, also called electric permittivity, is a constant of proportionality that exists between electric displacement and electric field intensity. This constant is equal to approximately $8.85 \times 10^{-12}$ farad per meter (F/m) in free space (a vacuum). In other materials it can be much different, often substantially greater than.	Understand	CO1	CLO3	AEEB11.03
15	What is Magnetic Permeance?	Definition: It is the measure of the ease with which flux can be set up in a material. In other words, it measures the magnitude of the flux for the number of turns in an electric circuit. The permeance is analogous to the conductance in an electrical circuit. It is reciprocal of the reluctance (S) of the material in a magnetic circuit. It is denoted by P and measured in Weber per ampere turns (Wb/AT) or Henry (H).	Understand	CO1	CLO3	AEEB11.03
16	What is singly excited system?	well a machines which has only one electrical supply either to stator and to rotor is a single excited machine like induction motor where we supply only to the stator and emf induces in rotor by induction and lenzs law causes machine to run so it has only one electrical supply so its singly excited machines	Remember	CO1	CLO3	AEEB11.03
17	What is field energy?	The energy density (energy per volume) is denoted by w, and has units of $V A s m^{-3}$ or $J m^{-3}$ . This translates the electric field energy, magnetic field energy, and electromagnetic field energy to. Transmission of field energy is also possible without a medium through empty space.	Remember	CO1	CLO2	AEEB11.02
18	What is energy in electric field?	The energy of an electric field results from the excitation of the space permeated by the electric field. It can be thought of as the potential energy that would be imparted on a point charge placed in the field.	Understand	CO1	CLO2	AEEB11.02

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
19	What are the types of energy conversion?	Energy conversion: Transformation of one form of energy into another, usually to convert the energy into a more useful form. first law of thermodynamics: Energy can neither be created nor destroyed. form of energy, Forms of energy include heat, light, electrical, mechanical, nuclear, sound and chemical.	Remember	CO1	CLO2	AEEB11.02
20	Do electric fields carry energy?	Electromagnetic waves can transport this field energy through space. Electromagnetic waves are changing electric and magnetic fields, carrying energy through space.	Understand	CO1	CLO1	AEEB11.01
21	What is energy density formula?	Energy Density is defined as the total amount of energy in a system per unit volume. For example, the amount of calories per gram of food. Therefore, the formula of energy density is the sum of the energy density of electric and magnetic field.	Remember	CO1	CLO1	AEEB11.01
22	Can an electric field exist without a magnetic field?	Electric fields can exist without a magnetic field - consider a stationary point charge. Magnetic fields cannot exist without any E field component because there are no magnetic monopoles. A stationary electric charge creates an electric field. A changing electric field creates a magnetic field.	Understand	CO1	CLO1	AEEB11.01
23	What kind of energy is stored in an electromagnet?	The energy associated with motion is called kinetic energy. The energy associated with position is called potential energy. Potential energy is not "stored energy". Energy can be stored in motion just as well as it can be stored in position.	Remember	CO1	CLO1	AEEB11.01
24	What are the three types of energy conversions?	Well, there are a lot of types of energy. There's kinetic (or movement) energy, gravitational potential (or stored) energy, elastic potential energy, chemical energy, light energy, sound energy, nuclear energy, mechanical energy, heat energy and many more.	Remember	CO1	CLO1	AEEB11.01
25	What are the methods of energy conversion?	Thermoelectric (Heat → Electric energy) Geothermal power (Heat → Electric energy) Heat engines, such as the internal combustion engine used in cars, or the steam engine (Heat → Mechanical energy) Ocean thermal power (Heat → Electric energy).	Remember	CO1	CLO1	AEEB11.01
26	Are electric fields and magnetic fields the same?	Similarities between magnetic fields and electric fields: Magnetic fields are associated with two magnetic poles, north and south, although they are also produced by charges (but moving charges). Like poles repel; unlike poles attract. Electric field points in the direction of the force experienced by a positive charge	Remember	CO1	CLO2	AEEB11.02

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
27	How do you measure the strength of an electromagnet?	You can create an electromagnet with a simple coil of wire and a battery. In this project, you will explore whether the strength of an electromagnet changes with the number of turns in the magnet's coil. You will measure the magnet's strength by counting the number of paper clips your electromagnet can lift.	Understand	CO1	CLO2	AEEB11.02
28	What factors affect the strength of an electromagnet?	The main factors that affect the strength of an electromagnet are: 1. Number of turns on the coil of wire around the core. 2. Strength of the current applied. 3. The material of the coil.	Understand	CO1	CLO2	AEEB11.02
29	How can the strength of an electromagnet be varied?	You can make an electromagnet stronger by doing these things: wrapping the coil around a piece of iron (such as an iron nail) adding more turns to the coil. increasing the current flowing through the coil.	Understand	CO1	CLO2	AEEB11.02
30	How does the strength of an electromagnet depend on the current?	Strength of Electromagnet increases when either the "Current" or "Number of turns in a coil" increases. They are directly proportional to strength of Electromagnet. Explanation: An electromagnet is a temporary magnet; the magnetic field only survives when an electric current is running through it.	Understand	CO1	CLO2	AEEB11.02
<b>MODULE-II</b>						
1	State Faradays second law of electromagnetic induction.	Faraday's second law of electromagnetic induction states that the magnitude of induced emf is equal to the rate of change of flux linkages with the coil.	Understand	CO2	CLO4	AEEB11.04
2	State Lenz's law	Lenz's law states that the current induced in a circuit due to a change or a motion in a magnetic field is so directed as to oppose the change in flux and to exert a mechanical force opposing the motion	Understand	CO2	CLO4	AEEB11.04
3	State Fleming's left hand rule	Fleming's left hand rule states that when the thumb, forefinger and the middle finger are stretched mutually perpendicular to each other such that the forefinger is in the direction of magnetic field and the middle finger is in the direction induced current, then thumb represents the direction of force.	Understand	CO2	CLO4	AEEB11.04
4	State Fleming's right hand rule	Fleming's right hand rule states that when the thumb, forefinger and the middle finger are stretched mutually perpendicular to each other such that the forefinger is in the direction of magnetic field and the thumb is in the direction force, then middle finger represents the direction of induced emf or current.	Understand	CO2	CLO4	AEEB11.04
5	Define pole pitch?	The pole pitch is defined as peripheral distance between center of two adjacent poles in dc machine. This distance is measured in term of armature slots or	Understand	CO2	CLO4	AEEB11.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		armature conductor come between two adjacent pole centers. This is naturally equal to the total number of armature slots divided by number of poles in the machine.				
6	Why are the field poles and armature core laminated?	Armature core is laminated to reduce eddy current losses .. By using thin laminations we increase resistance of eddy current path thereby reducing the eddy currents and eddy current losses	Understand	CO2	CLO4	AEEB11.04
7	What is the purpose of brushes in a DC generator?	Originally Answered: What is the exact purpose of brushes in a DC motor? The brushes in a DC motor have two purposes. They carry current to the armature (the rotating part). The brushes work with the commutator to switch the current to the proper winding of the armature as it rotates.	Understand	CO2	CLO4	AEEB11.04
8	What are the advantages of carbon brushes?	Advantages and disadvantages of carbon brushes. *If sparking occurs they damage the commutator less than with the copper brushes. *Contact resistance is high and cause a loss of about 2 V.Hence they are not suited for low voltage machines	Understand	CO2	CLO4	AEEB11.04
9	Why Interpoles are used in DC machine?	Interpoles are similar to the main field poles and located on the yoke between the main field poles. They have windings in series with the armature winding. Interpoles have the function of reducing the armature reaction effect in the commutating zone. They eliminate the need to shift the brush assembly	Remember	CO2	CLO4	AEEB11.04
10	Describe armature reaction in dc machine.	Armature Reaction in a DC Generator. Definition: The armature reaction simply shows the effect of armature field on the main field. In other words, the armature reaction represents the impact of the armature flux on the main field flux.	Remember	CO2	CLO4	AEEB11.04
11	How armature reaction in a DC generator can be minimized?	The armature reaction causes the distortion in main field flux. This can be reduced if the reluctance of the path of the cross-magnetizing field is increased. The armature teeth and air gap at pole tips offer reluctance to armature flux. Thus by increasing length of air gap, the armature reaction effect is reduced	Remember	CO2	CLO4	AEEB11.04
12	Describe GNA and MNA.	GNA is the axis of symmetry between the adjacent poles. MNA is always perpendicular to the resultant magnetic flux in the air gap ,it can be beacuse of main magnetic field and armature field. ... MNA is the axis along which there is no emf generated in the armature of dc machine.	Understand	CO2	CLO4	AEEB11.04
13	Why Carbon Brushes Placed along MNA in a DC Generator?	Carbon Brushes are used collect the current due to the induced emf from the armature coils in a DC Generator, as all of us know. To prevent this, brushes are positioned in such a way that the coil	Remember	CO2	CLO4	AEEB11.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		being short circuited has no induced emf in it.				
14	Describe compensating winding in DC machine.	Compensating Windings or Interpoles are used for this purpose. The cross-magnetizing effect of armature reaction may cause trouble in d.c. machines subjected to large fluctuations in load. In order to neutralize the cross magnetizing effect of armature reaction, a compensating winding is used.	Remember	CO2	CLO4	AEEB11.04
15	Define commutator function?	A commutator is a rotary electrical switch in certain types of electric motors and electrical generators that periodically reverses the current direction between the rotor and the external circuit. By reversing the current direction in the rotating windings each half turn, a steady rotating force (torque) is produced.	Understand	CO2	CLO4	AEEB11.04
16	Describe the function of carbon brushes in DC motor.	In dc motors, the carbon brush makes sure the commutation process remains free from sparks and helps conduct electric current between the moving parts of the motor. A dc motor has several components, and each serves an important role in ensuring its proper function and efficient performance.	Remember	CO2	CLO4	AEEB11.04
17	Define residual magnetism?	Remanence or remanent magnetization or residual magnetism is the magnetization left behind in a ferromagnetic material (such as iron) after an external magnetic field is removed. Colloquially, when a magnet is "magnetized" it has remanence.	Understand	CO2	CLO5	AEEB11.05
18	What is the difference between commutator and slip ring?	"A split-ring commutator makes the current change direction every half-rotation, whereas a slip-ring commutator merely maintains a connection between the moving rotor and the stationary stator."	Remember	CO2	CLO4	AEEB11.04
19	Define retentivity and coercivity?	Coercivity is the intensity of the applied magnetic field required to reduce the magnetization of a given material to zero. In other words to coerce the material to surrender its magnetism. Retentivity is the capacity of an object to retain magnetism after the action of the magnetizing force has ceased.	Remember	CO2	CLO5	AEEB11.05
20	What is the importance of LPT and TPT?	leading pole tip (LPT) and trailing pole tip (TPT) are the two edges of the pole. for easy identification these terms are used. LPT and TPT are depends upon the direction of motion of the armature(in case of dc)	Understand	CO2	CLO4	AEEB11.04
21	Define demagnetising effect?	In both the generating and motoring modes, the armature carries current and a magnetic field is established, which is called the armature flux. When the main field gets distorted, it is known as a cross magnetizing effect. And when the main	Remember	CO2	CLO4	AEEB11.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		field flux gets reduced, it is known as the demagnetizing effect.				
22	Define cross magnetization effect?	The cross magnetizing armature reaction effect is mainly caused by armature conductors which are located under the pole arc. At high loads, this effect of armature reaction may cause excessive flux density in the trailing pole tip (in generator) and leading pole tip (in motor)	Remember	CO2	CLO5	AEEB11.05
23	Describe commutation period.	Commutation in DC Machine. When the brush span has two commutator segments, the winding element connected to those segments is short-circuited. The term Commutation means the change that takes place in a winding element during the period of a short circuit by a brush	Understand	CO2	CLO4	AEEB11.04
24	What do you mean by poor commutation?	A machine is said to be in poor commutation if there is sparking at the brushes and commutator surface. Poor commutation can be caused by mechanical or electrical condition	Understand	CO2	CLO4	AEEB11.04
25	What are the essential conditions of the voltage build up of a self-excited DC generator?	Field and armature winding must be correctly connected so that initial mmf adds residual flux. Resistance of field windings must be less than critical resistance	Remember	CO2	CLO5	AEEB11.05
26	Describe critical speed in DC generator?	Critical Speed: It is that speed for which the given shunt field resistance becomes the critical field resistance.	Understand	CO2	CLO5	AEEB11.05
27	What is meant by critical field resistance in DC generator?	Critical Field Resistance: It is that value of the field resistance at which the D.C. shunt generator will fail to excite.	Understand		CLO5	AEEB11.05
28	What are the reasons for non up voltage in DC generator?	Causes of failure of voltage build-up or armature heating  1. No residual magnetism. Without any residual magnetism, voltage build-up cannot start. 2. High field circuit resistances. If field resistances is more critical resistance then the voltage will not build up. 3. Speed less than the critical speed.	Remember	CO2	CLO5	AEEB11.05
29	Which generator has poorest voltage regulation?	During On-load conditions its Differentially Compounded DC generator that has the poorest voltage regulation. In differential compound machine shunt and series field flux are subtracted and the net field flux is reduced	Understand	CO2	CLO5	AEEB11.05
30	How does a generator lose residual magnetism?	Residual magnetism in the generator exciter field allows the generator to build up voltage during start-up. This magnetism is sometimes lost due to shelf time or improper operation, among other reasons.	Understand	CO2	CLO5	AEEB11.05
<b>MODULE-III</b>						



S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
1	What is the significance of back EMF	Back EMF is very significant in the working of a dc motor. The presence of back EMF makes the d.c. motor a self-regulating machine i.e., it makes the motor to draw as much armature current as is just sufficient to develop the torque required by the load	Understand	CO3	CLO7	AEEB11.07
2	Why back EMF is produced?	Back emf is the voltage produced (generated) in a motor as it spins. When a armature is moving in a permanent magnetic field than induced current in the coil and this current also produced magnetic field.	Understand	CO3	CLO7	AEEB11.07
3	Define torque?	Torque is the turning force through a radius - with the units Nm in the SI-system and the units lb ft in the imperial system. The torque developed by an asynchronous induction motor varies when the motor accelerates from zero to maximum operating speed.	Remember	CO3	CLO7	AEEB11.07
4	What is difference between torque and speed?	Speed of a motor is the rate at which it spins and is often given in "rpm" or rotations per minute. While torque is the amount of twisting force generated by the motor (often through a shaft). Higher speed does not necessarily imply high torque. Two motors having same speed may deliver different torque values	Understand	CO3	CLO7	AEEB11.07
5	Why should a series motor never be operated without load?	This is the reason why DC series motor should never be started or Operated on light loads or No load conditions. This can be seen from the speed-armature current and the speed-torque characteristics that on low armature current and low torque condition motor shows a tendency to rotate with dangerously high speed.	Understand	CO3	CLO7	AEEB11.07
6	What is the condition for maximum efficiency of a DC shunt generator?	Condition for the maximum efficiency of DC shunt motor is the core loss or the no load losses or constant loss of that DC shunt motor have to be equals to the copper loss or full load losses or variable losses of that motor.	Remember	CO3	CLO8	AEEB11.08
7	Which type of starter is used to start the DC shunt motor?	A 3 point starter is used for starting a DC shunt motor.	Remember	CO3	CLO8	AEEB11.08
8	Why iron losses are called constant losses?	Iron losses depends upon supply frequency, maximum flux density in the core, volume of the core, etc. As the supply frequency, volume for a transformer typically remains constant, so the iron losses of a transformer is constant.	Understand	CO3	CLO8	AEEB11.08
9	How can eddy current loss be reduced?	In order to reduce the eddy current loss, the resistance of the core should be increased. In devices like transformers, the core is made up of thin sheets of steel, each lamination being insulated from others by a thin layer of varnish. As	Remember	CO3	CLO8	AEEB11.08

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		the laminations are thin, they will have relatively high resistance.				
10	Describe no volt release coil.	No volt release coil is basically a relay system which automatically trips off the motor if supply is cut off or decreased beyond a limit so that it doesn't start automatically to lowest armature resistance next time when supply is given.	Understand	CO3	CLO8	AEEB11.08
11	Why Swinburne's test is called indirect test?	Swinburne's Test is an indirect method of testing of DC machines. In this method the losses are measured separately and the efficiency at any desired load is predetermined. Machines are tested for finding out losses, efficiency and temperature rise.	Understand	CO3	CLO9	AEEB11.09
12	Describe regenerative test.	Hopkinson's Test is also known as Regenerative Test, Back to Back test and Heat Run Test. In Hopkinson Test, two identical shunt machines are required which are coupled both mechanically and electrically in parallel. One is acting as a motor and another one as a generator.	Understand	CO3	CLO9	AEEB11.09
13	Describe retardation test.	Retardation or Running Down Test. This method is applicable to shunt motors and generators and is used for finding stray losses. Then, knowing the armature and shunt Cu losses at a given load current, efficiency can be calculated	Understand	CO3	CLO9	AEEB11.09
14	What are the losses in a DC machine?	The losses that occur in a DC Machine is divided into five basic categories. The various losses are Electrical or Copper losses ( $I^2R$ losses), Core losses or Iron losses, Brush losses, Mechanical losses, Stray load losses	Remember	CO3	CLO8	AEEB11.08
15	Describe efficiency of a motor?	Electric motor efficiency is the ratio between power output (mechanical) and power input (electrical). Mechanical power output is always lower than the electrical power input, as energy is lost during conversion (electrical to mechanical) in various forms, such as heat and friction	Remember	CO3	CLO8	AEEB11.08
16	What is the condition for maximum efficiency in a DC motor?	Condition for Maximum Efficiency in DC Machine It varies from motor to motor, but typically the maximum efficiency is when running at about 80 percent of maximum speed, driving a load that is about 20 percent of the maximum stall torque	Remember	CO3	CLO8	AEEB11.08
17	Why is the starting current high in DC motor?	It's armature has very less resistance due to this it need more current at starting time. Hence DC starters are used to limit the starting current of motor. ... The starting current is high as there is no back EMF or counter EMF present in the	Remember	CO3	CLO7	AEEB11.07

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		armature circuit because at starting counter EMF is zero				
18	How do you control the speed of a shunt DC motor?	Speed control of Shunt motor 1. Flux control method. 2. Armature control method 3. Voltage Control Method 4. Flux control method 5. Variable resistance in series with armature 6. Series-parallel control	Understand	CO3	CLO7	AEEB11.07
19	How does voltage affect motor speed?	Input Voltage: For a fixed load, the speed of the motor is affected by applied voltage. Increase in voltage = increase in speed. Load Torque: For a fixed voltage, the speed of the motor is inversely affected by the load. Increase in load torque = decrease in speed.	Understand	CO3	CLO7	AEEB11.07
20	How can the direction of rotation of a DC electric motor be changed?	The direction of current is controlled by the polarity of the voltage. So in order to change the direction of rotation, we can simply reverse the voltage, causing the current to flow in the opposite direction, changing the force by 180 degrees and the motor to be driven 'backwards'.	Understand	CO3	CLO7	AEEB11.07
21	How can the direction of rotation of a series motor be reversed?	Direction reversal of separately excited DC Motor: From Equation(1), it is clear that the direction of the torque and the speed can be reversed by changing the direction of either the field current or armature current by changing the polarity of the DC voltage	Understand	CO3	CLO7	AEEB11.07
22	What happens when a DC motor is connected across an AC supply?	When A.C. supply is given to a D.C. motor: 1)In case of Series connection of armature winding and field winding , it may run. 2)But, In case of parallel connection , it won't rotate at all and will start humming and will create vibrations, as a torque produced by positive and negative cycle will cancel out each other.	Understand	CO3	CLO7	AEEB11.07
23	At what condition a DC motor will develop maximum power?	Condition for Maximum Power. Thus maximum efficiency of a dc motor occurs when back EMF is equal to half the applied voltage.	Remember	CO3	CLO8	AEEB11.08
24	Describe speed regulation of a DC motor?	The speed regulation of a DC Motor is defined as the change in speed from no load to full load. It is expressed as a fraction or a percentage of the full load speed	Remember	CO3	CLO7	AEEB11.07
25	How is torque developed in dc motor?	Torque Equation of DC Motor. When a DC machine is loaded either as a motor or as a generator, the rotor conductors carry current. These conductors lie in the magnetic field of the air gap. ... Hence torque is produced at the circumference of the rotor and rotor starts rotating.	Remember	CO3	CLO7	AEEB11.07
26	What will happen if the field winding of a running DC motor is opened?	In DC shunt motor if field winding supply is removed the motor back emf will drop to zero, hence the armature will draw more current to make up the emf this results in blowing up of fuse.	Understand	CO3	CLO7	AEEB11.07

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
27	What is CRGO full form?	It is used for the cores of power and distribution transformers, cold-rolled grain-oriented steel is often abbreviated to CRGO. CRGO is usually supplied by the producing mills in coil form and has to be cut into "laminations", which are then used to form a transformer core, which is an integral part of any transformer.	Remember	CO3	CLO7	AEEB11.07
28	Which motor is used in train?	Series-wound DC motors. That means current flows through the armature, then through the fields. They have high starting torque, favorable for starting a train	Remember	CO3	CLO7	AEEB11.07
29	Why DC motor is used in traction?	There are two main reasons for using DC series motor for traction purpose. They are: It has high starting torque which is important in traction system. It requires less power for high torque production because torque production is directly proportional to the square of the armature current.	Understand	CO3	CLO7	AEEB11.07
30	Why do series motors have high starting torque?	For any dc motor, torque is directly proportional to the flux and armature current. Hence torque is directly proportional to the square of armature current. So as current during starting is 1.5 times the rated so starting torque is higher for series motor.	Remember	CO3	CLO7	AEEB11.07
<b>MODULE-IV</b>						
1	Define principle of transformer?	A transformer consists of two electrically isolated coils and operates on Faraday's principal of "mutual induction", in which an EMF is induced in the transformers secondary coil by the magnetic flux generated by the voltages and currents flowing in the primary coil winding.	Remember	CO4	CLO10	AEEB11.10
2	What are the two main types of transformers?	There are three primary types of voltage transformers (VT): electromagnetic, capacitor, and optical. The electromagnetic voltage transformer is a wire-wound transformer. The capacitor voltage transformer uses a capacitance potential divider and is used at higher voltages due to a lower cost than an electromagnetic VT.	Remember	CO4	CLO10	AEEB11.10
3	Describe ideal transformer?	An ideal transformer is an imaginary <b>transformer</b> which has. - no copper losses (no winding resistance) - no iron loss in core. - no leakage flux. In other words, an ideal transformer gives output power exactly equal to the input power.	Understand	CO4	CLO10	AEEB11.10
4	Can transformer work on DC?	So in that sense, yes, a transformer "works" with DC. But no, you cannot pass DC through the transformer from primary to secondary as you can with AC. As transformer works on the Principle of Electro-Magnetic Induction, which is produced by Alternating Current	Understand	CO4	CLO10	AEEB11.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		(AC) and not by Direct Current (DC).				
5	Why are transformers rated in kVA?	Copper losses ( $I^2R$ ) depends on Current which passing through transformer winding while Iron Losses or Core Losses or Insulation Losses depends on Voltage. So the Cu Losses depend on the rating current of the load so the load type will determine the powerfactor P.F , Thats why the rating of Transformer in kVA,Not in kW.	Understand	CO4	CLO10	AEEB11.10
6	Which type of oil is used in transformer?	Transformer oil or insulating oil is an oil that is stable at high temperatures and has excellent electrical insulating properties. It is used in oil-filled transformers, some types of high-voltage capacitors, fluorescent lamp ballasts, and some types of high-voltage switches and circuit breakers.	Remember	CO4	CLO10	AEEB11.10
7	What is the importance of equivalent circuit?	An equivalent circuit is a very useful way of understanding or predicting the operation and behaviour of an electrical circuit or apparatus. It requires the deconstruction of the circuit into ideal simple circuit elements – e.g. resistors, inductor, capacitors, rectifiers, voltage and current sources.	Understand	CO4	CLO10	AEEB11.10
8	Which gas is used in transformer?	Gas is used as an insulating and cooling agent in gas insulated transformers. Sulphur hexafluoride ( $SF_6$ ) is the main gas used in these types of transformer at present although other gases are under developmen	Remember	CO4	CLO10	AEEB11.10
9	Why Buchholz relay is used in a transformer?	Buchholz relay is used for the protection of transformers from the faults occurring inside the transformer. Short circuit faults such as inter turn faults, incipient winding faults, and core faults may occur due to the impulse breakdown of the insulating oil or simply the transformer oil.	Understand	CO4	CLO10	AEEB11.10
10	Why conservator is used in transformer?	Function of Conservator Tank of a Transformer. When transformer is loaded and when ambient temperature rises, the volume of oil inside transformer increases. A conservator tank of transformer provides adequate space to this expanded transformer oil. It also acts as a reservoir for transformer insulating oil.	Understand	CO4	CLO10	AEEB11.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
11	Why is silica gel used in transformers?	Function of Silica Gel Breather. Most of the power generation companies use silica gel breathers fitted to the conservator of oil filled transformers. The purpose of these silica gel breathers is to absorb the moisture in the air sucked in by the transformer during the breathing process.	Understand	CO4	CLO10	AEEB11.10
12	What is standard for BDV of transformer oil?	For measuring BDV of transformer oil, portable BDV measuring kit is generally available at site. Minimum breakdown voltage of transformer oil or dielectric strength of transformer oil at which this oil can safely be used in transformer, is considered as 30 KV	Remember	CO4	CLO10	AEEB11.10
13	Why tap are provided on HV side of transformer?	Why tappings are provided on the high voltage side of the transformer? There are some reasons for tapping on the high voltage side of the large transformer which are, In large transformers, the high voltage(HV) winding is generally wound over the low voltage (LV)winding for insulation saving purpose.	Understand	CO4	CLO10	AEEB11.10
14	What is the use of bushing in transformer?	In electric power, a bushing is an insulated device that allows an electrical conductor to pass safely through a grounded conducting barrier such as the case of a transformer or circuit breaker. Bushings are typically made from porcelain; though other insulating materials are also possible, generally porcelain is used	Understand	CO4	CLO10	AEEB11.10
15	How does a transformer MOG work?	MOG ( magnetic oil gauge ) of Transformer. The MOG (Magnetic Oil Gauge) is a device by which we can supervise the level of liquid/oil inside the tank or conservator of power transformer and also gives us an alert low oil level indication with making mercury switch.	Understand	CO4	CLO10	AEEB11.10
16	How many types of transformer oil are there?	There are two types of oil used: Type I and Type II. Type I oil is used in equipment that does not require much oxidation resistance; Type II oil offers greater protection against oxidation.	Remember	CO4	CLO10	AEEB11.10
17	What are the qualities of good transformer oil?	Synthetic transformer oil like chlorinated diphenyl has excellent properties like chemical stability, non-oxidizing, good dielectric strength, moisture repellent, reduced risk due to fire and explosion	Remember	CO4	CLO10	AEEB11.10
18	What are the different methods of cooling?	Based on the coolant used the cooling methods can be classified into: Air cooling. Oil and Air cooling. Oil and Water cooling.	Remember	CO4	CLO10	AEEB11.10
19	What is the function of radiator in transformer?	Radiator is a bank of hollow pipe line which is used to transfer the thermal energy from one medium to another for the purpose of cooling. Some Bank are used at the power transformer for cooling the transformer oil as well as reduces the winding temperature under loading	Understand	CO4	CLO10	AEEB11.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		condition.				
20	Describe explosion vent in transformer.	Explosion Vent. The explosion vent is used to expel boiling oil in the transformer during heavy internal faults in order to avoid the explosion of the transformer.	Understand	CO4	CLO10	AEEB11.10
21	Define All day efficiency?	All Day Efficiency is defined as the ratio of total energy output for 24 hrs i.e. for the whole day to the total energy input for the same day. All Day Efficiency is basically Energy Efficiency of Transformer calculated for a period of 24 hrs.	Remember	CO4	CLO10	AEEB11.10
22	What is the maximum efficiency condition for transformer?	Transformer efficiency is denoted by $\eta$ . Efficiency is maximum in a transformer when Copper losses = Iron losses.	Remember	CO4	CLO10	AEEB11.10
23	Which transformer has high efficiency?	Transformers are in general highly efficient, and large power transformers (around 100 MVA and larger) may attain an efficiency as high as 99.75%. Small transformers such as a plug-in used to power small consumer electronics may be less than 85% efficient. Hence Generator/Motor has less efficiency than transformers.	Remember	CO4	CLO10	AEEB11.10
24	Why the efficiency of transformer is high as compared to DC machine?	The efficiency of transformer is greater than any other electrical machines. This is due to transformer is a static device and there is no any mechanical losses in transformers. While if you say DC machine then there is a rotational part so their losses is greater than the transformer.	Understand	CO4	CLO10	AEEB11.10
25	What are the conditions of parallel operation?	There are various conditions that must fulfilled for the successful operation of transformers as follows. 1. The line voltage ratio of two transformers must be equal. 2. The per unit impedance of each transformer should be equal and they should have same ratio of equivalent leakage reactance to the equal resistance(X/R).	Remember	CO4	CLO13	AEEB11.13
26	What will happen if two transformers are connected in parallel with wrong polarity?	An incorrect polarity connection of these transformers will result in dead short circuit. Explanation: If the percentage impedances of the two transformers which are working in the parallel are different, then parallel operation is still possible, but load sharing will not be in the ratio of their kVA loads.	Understand	CO4	CLO13	AEEB11.13
27	What will happen if two transformer are connected in parallel with unequal impedance?	when two transformer are connected in parallel condition, and the polarity of transformer are opposite to each other then a large circulating current flow through out the winding, therefore a very small current flow thro, the load .therefore lifespan of transformer will be reduced.	Understand	CO4	CLO13	AEEB11.13

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
28	What is difference between power and distribution transformer?	Main Differences. Power transformers are used in transmission network of higher voltages for step-up and step down application (400 kV, 200 kV, 110 kV, 66 kV, 33kV) and are generally rated above 200MVA. Distribution transformers are used for lower voltage distribution networks as a means to end user connectivity.	Understand	CO4	CLO13	AEEB11.13
29	What is the significance of turns ratio in a transformer?	The turns ratio of a transformer describes the number of wire turns on the input versus the number of turns on the output. A 1:1 transformer would have the same number of turns on each coil while a 1:2 transformer would have twice as many on the secondary.	Understand	CO4	CLO10	AEEB11.10
30	What is an ideal transformer?	An ideal transformer is an imaginary transformer which has. - no copper losses (no winding resistance) - no iron loss in core. - no leakage flux. In other words, an ideal transformer gives output power exactly equal to the input power.	Understand	CO4	CLO10	AEEB11.10
<b>MODULE-V</b>						
1	Why do we use Star and Delta Connection?	The phase voltage is lower than line voltage in star connection, so the motors or drives connected in star connection runs at lower speed as compared to delta connection. Star Connection is preferable in transmission system as the voltage insulation required is less. Delta connection is used in Distribution system	Understand	CO5	CLO14	AEEB11.14
2	What are the uses of three phase transformer?	Three phase transformers are designed to supply electric power to three-phase systems. These electrical devices have three circuit conductors and may or may not have a neutral wire. Three phase power is used by electric power distribution grids and to power large motors and other large loads.	Understand	CO5	CLO14	AEEB11.14
3	What is difference between Star and Delta Connection?	The network formed is known as Star Connection. The three branches of the network are connected in such a way that it forms a closed loop known as Delta Connection. In a star connection, the starting and the finishing point ends of the three coils are connected together to a common point known as the neutral point.	Remember	CO5	CLO14	AEEB11.14
4	What happens if one phase of a 3 phase transformer fails?	When a three phase motor loses one of the phase supply voltage then it is called Single Phasing. Single Phasing a case when any one phase out of the three phases fails. The motor will run but would not be able to drive rated load. The uneven torque results in abnormal noise and vibration in motor.	Remember	CO5	CLO15	AEEB11.15
5	Why distribution transformer secondary side is always star	Third harmonic current will be circulated in transformer itself and will not be allowed to flow into the supply lines. Star secondary is more stable on unbalanced	Remember	CO5	CLO14	AEEB11.14



S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	connected?	loading				
6	Which type of connection is used in distribution transformer?	There is the so called Zig-Zag connection which is used in municipal level transformers. This connection is used with a Delta as primary(Dz). In short it is better for non-symmetric loads because the load is shared between the phase conductors, which is one of the main advantages.	Remember	CO5	CLO14	AEEB11.14
7	What are the advantage of Delta Connection?	An advantage of the Delta connection is higher reliability. If one of the three primary windings fails, the secondary will still produce full voltage on all three phases. The only requirement is that the remaining two phases must be able to carry the load.	Remember	CO5	CLO14	AEEB11.14
8	What are the conditions for parallel operation of two three phase transformers?	For the satisfactory parallel operation of the transformer, the two main conditions are necessary. One is that the Polarities of the transformers must be same. Another condition is that the Turn Ratio of the transformer should be equal. The voltage at full load across the transformer internal impedance should be equal.	Remember	CO5	CLO14	AEEB11.14
9	Describe scott connection of transformer.	A Scott-T transformer (also called a Scott connection) is a type of circuit used to produce two-phase electric power ( 2 $\phi$ , 90 degree phase rotation) from a three-phase ( 3 $\phi$ , 120 degree phase rotation) source, or vice versa. The Scott connection evenly distributes a balanced load between the phases of the source.	Understand	CO5	CLO15	AEEB11.15
10	Describe teaser transformer.	A teaser transformer is the second transformer of a two transformer set in a Scott-T or T-T transformer bank. The teaser transformer is tapped at 86.6% of the main transformer on the HV set of windings. The two transformers convert a 3-phase input to a 2-phase, 5-wire, output	Remember	CO5	CLO15	AEEB11.15
11	Which connection is better Star or Delta?	The phase voltage is lower than line voltage in star connection, so the motors or drives connected in star connection runs at lower speed as compared to delta connection. Star Connection is preferable in transmission system as the voltage insulation required is less. Delta connection is used in Distribution system	Remember	CO5	CLO14	CAEEB11.14
12	What is the use of Scott connection of transformer?	Scott-T transformer (also called a Scott connection) is a type of circuit used to derive two-phase power from a three-phase source or vice-versa. The Scott connection evenly distributes a balanced load between the phases of the source.	Understand	CO5	CLO15	AEEB11.15
13	What is the use of auto transformer?	The autotransformer has many uses and applications including the starting of induction motors, used to regulate the voltage of transmission lines, and can be used to transform voltages when the primary to secondary ratio is close to	Understand	CO5	CLO15	CAEEB11.15

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		unity.				
14	What is the difference between transformer and autotransformer?	An autotransformer has only one winding which acts both as a primary and the secondary whereas the conventional transformer has a two separate windings, i.e., the primary and the secondary winding. The auto-transformer is smaller in size, whereas the conventional transformer is larger in size.	Understand	CO5	CLO15	AEEB11.15
15	List out the Cooling methods for Dry type Transformers	Air Natural or Self air cooled transformer. This method of transformer cooling is generally used in small transformers (upto 3 MVA) 1. Air Blast. 2. Oil Natural Air Natural (ONAN) 3. Oil Natural Air Forced (ONAF) 4. Oil Forced Air Forced (OFAF) ... 5. Oil Forced Water Forced (OFWF)	Remember	CO5	CLO15	AEEB11.15
16	Describe OLTC in transformer.	On-load tap changer (OLTC), also known as On-circuit tap changer (OCTC), is a tap changer in applications where a supply interruption during a tap change is unacceptable, the transformer is often fitted with a more expensive and complex on load tap changing mechanism.	Remember	CO5	CLO15	AEEB11.15
17	Describe temperature rise in a transformer.	Transformer temperature rise is defined as the average temperature rise of the windings above the ambient (surrounding) temperature, when the transformer is loaded at its nameplate rating	Understand	CO5	CLO15	AEEB11.15
18	Why does a transformer heat up?	The losses arise from: Winding resistance: Current flowing through the windings causes resistive heating of the conductors. Eddy currents: Induced currents circulate in the core and cause it resistive heating. Stray losses: Not all the magnetic field produced by the primary is intercepted by the secondary.	Understand	CO5	CLO15	AEEB11.15
19	Describe phase sequence in three phase system.	In three phase system the order in which the voltages attain their maximum positive value is called Phase Sequence.	Understand	CO5	CLO14	AEEB11.14
20	Describe star connection is used in transmission.	For power transmission higher voltages are preferred for obvious reasons. To that step up transformer is needed, and for transformer economic reasons star connection is preferred. In distribution most loads are single phase, to reduce the imbalance imposed on the source, a delta winding is generally used	Understand	CO5	CLO14	AEEB11.14
21	Describe positive phase sequence.	Positive Sequence: A balanced three-phase system with the same phase sequence as the original sequence.	Understand	CO5	CLO14	AEEB11.14
22	Describe negative phase sequence.	Negative sequence: A balanced three-phase system with the opposite phase sequence as the original sequence.	Understand	CO5	CLO14	AEEB11.14
23	Describe Zero phase sequence.	Zero Sequence: Three phasors that are equal in magnitude and phase.	Understand	CO5	CLO14	AEEB11.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
24	Which transformer is used in transmission?	Power transformers are used in transmission network of higher voltages for step-up and step down application (400 kV, 200 kV, 110 kV, 66 kV, 33kV) and are generally rated above 200MVA	Remember	CO5	CLO14	AEEB11.14
25	Causes of negative phase sequence?	A current or voltage unbalance between phases in magnitude or phase angle gives rise to negative and zero-sequence components. The negative sequence component has a rotation opposite that of the power system. The resulting eddy currents are very large and cause severe heating of the rotor	Understand	CO5	CLO14	AEEB11.14
26	Why Delta Connection is used in transmission line?	The delta winding allows third-harmonic currents to circulate within the transformer, and prevents third-harmonic currents from flowing in the supply line. Delta connected windings are not common for higher transmission voltages (138 kV and above) owing to the higher cost of insulation compared with a wye connection.	Remember	CO5	CLO14	AEEB11.14
27	Can you use a 3 phase transformer for single phase?	A 3 phase transformer can work as a single phase transformer also. Theoretically, it is possible to parallel the three phase connections at both primary and secondary side to convert it into single phase transformer. The flux in core remains sinusoidal and produces sinusoidal secondary supply voltage	Understand	CO5	CLO14	AEEB11.14
28	Why can autotransformers handle more power than conventional transformers of the same size?	An autotransformers can handle more power than conventional transformers of the same physical size. Clearly, the single winding of the autotransformer can be bigger than the two windings of a conventional transformer occupying the same physical space.	Understand	CO5	CLO15	AEEB11.15
29	How do you measure the winding temperature of a transformer?	Temperature Rise Test of Transformer 1. First, the LV winding of the transformer is short-circuited. 2. Then one thermometer is placed in a pocket in the transformer top cover. 3. The voltage of such value is applied to the HV winding that power input is equal to no load losses plus load losses corrected to a reference temperature of 75°C.	Understand	CO5	CLO14	AEEB11.14
30	What is the advantage of autotransformer?	Advantages of Auto transformers: Its efficiency is more when compared with the conventional one. Its size is relatively very smaller. Voltage Regulation of auto transformer is much better.	Remember	CO5	CLO15	AEEB11.15

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