INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY

Course Name	:	**AC MACHINES**
Course Code	:	**AEE007**
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Semester	:	**IV**
Branch	:	**Electrical and Electronics Engineering**
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Course Faculty	:	**Mr. P Mabuhussain, Assistant Professor, EEE** **Mr. K Devender Reddy, Assistant Professor, EEE**

OBJECTIVES

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
UNIT - I					
1	Define magnetic flux.	Magnetic flux is a measurement of the total magnetic lines of force which passes through a given area	Remember	CLO 1	CAEE007.01
2	Define magnetic flux density.	The flux per unit area is called as magnetic flux density.	Remember	CLO 1	CAEE007.01
3	State Fardays first law of electromagnetic induction.	The first law of Faraday's electroma gnetic induction state that whenever a conductor are placed in a varying magnetic field emf are induced which is called induced emf, if the conductor circuit are closed current are also induced which is called induced current	Understand	CLO 1	CAEE007.01
4	State Fardays 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	CLO 1	CAEE007.01
4	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	CLO 1	CAEE007.01
5	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 thump represents the direction of force.	Understand	CLO 1	CAEE007.01
6	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	CLO 1	CAEE007.01
7	What are the other names for induction motor?	The induction motor is also called as a rotating transformer or an asynchronous motor.	Remember	CLO 1	CAEE007.01
8	Why an induction motor is called a rotating transformer?	An induction motor is sometimes called a rotating transformer because the stator (stationary part) is essentially the primary side of the transformer and the rotor (rotating part) is the secondary side.	Understand	CLO 1	CAEE007.01
9	Why an induction motor is also called an asynchronous motor?	An induction motor is also called as an asynchronous motor because the speed of induction motor is always less than the synchronous speed.	Remember	CLO 1	CAEE007.01
10	How the synchronous speed of a mchine be calculated?	If the machine has 'P' number of poles, and is supplied with the frequency of 'f' then the synchronous speed is expressed as Ns = 120f/P	Remember	CLO 1	CAEE007.01
12	Define is RMF?	RMF (Rotationg Magnetic Field) is the field produced in the stator of a three phase inuction motor when supplied with a threephase balnced supply. The RMF has constant magnitude and rotate in spac at synchronous speed.	Remember	CLO 1	CAEE007.01

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13	What is the direction of RMF?	The direction of rotating magnetic field(RMF) is from the axis of the leading phase f the three phase winding towards the lagging phase of the winding.	Remember	CLO 1	CAEE007.01
14	How the direction of RMF be reversed?	The direction of RMF is reversed by interchanging the any two terminals of three phase winding while connecting it to a three phase AC supply.	Understand	CLO 1	CAEE007.01
15	What is a stator?	The stator consists of wound 'poles' that carry the supply current that induces a magnetic field in the conductor. The number of 'poles' can vary between motor types but the poles are always in pairs (i.e. 2, 4, 6, etc.).	Understand	CLO 1	CAEE007.01
16	What is a rotor?	The rotor is the non-stationary part of a rotary electric motor or alternator, which rotates because the wires and magnetic field of the motor are arranged so that a torque is developed about the rotor's axis. In some designs, the rotor can act to serve as the motor's armature, across which the input voltage is supplied. The stationary part of an electric motor is the stator.	Understand	CLO 1	CAEE007.01
17	What is an air gap ?	It is a small gap between the stator and rotor through which power is delivered to rotor in the form of rotating magnetic field.	Remember	CLO 1	CAEE007.01
18	What are slip rings?	Slip rings are the devices that can transmit power between a stationary component and a rotating component.	Remember	CLO 1	CAEE007.01
19	Classify the types of induction motors.	The induction motors are classifed into two types based on the construction of rotor such as Squirrel cage induction motor Slipring induction motor	Understand	CLO 1	CAEE007.01
20	What is other name of squirrel cage induction motor?	Cylindrical motor	Remember	CLO 1	CAEE007.01
21	What is other name of slip ring induction motor?	Wound type motor	Remember	CLO 1	CAEE007.01
22	Define slip speed.	Difference between the speed of the rotor and speed of the rotating magnetic field in the stator is called slip speed.	Remember	CLO 1	CAEE007.01
23	Define slip.	When the slip speed is expressed as percentage of synchronous speed , it is called as slip of induction motor.	Remember	CLO 1	CAEE007.01
24	Write the expression for calculating the slip.	If the synchronous speed of the RMF is Ns, and the speed of the rotor isN, then slip can be calculated as S = (Ns-N)/Ns	Remember	CLO 1	CAEE007.01
25	Write the epression for rotor frequency.	If the induction motor is supplied with the frequency ‘f’ then the frequency of rotor ‘fr’ is expressed as f = S*f, where S is the slip of induction motor.	Remember	CLO 1	CAEE007.01
26	What is the range of slip for an induction motor.	The slip (S) of an induction motor is ranges form 0 to 1. S=0 when the nduction motor rotor is running at exactly at synchronous speed, and S=1 when the induction motor is at rest or in stand still condition.	Understand	CLO 1	CAEE007.01
27	Discuss why the rotor conductors are skewed in squirrel cage induction motor.	The rotor slots of a three -phase induction motor are skewed to make the motor run quietly by reducing the magnetic hum and reduce the locking tendency of the rotor	Remember	CLO 1	CAEE007.01

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28	Define torque.	Torque is a measure of the force that can cause an object to rotate about an axis. Just as force is what causes an object to accelerate in linear kinematics, torque is what causes an object to acquire angular acceleration. Torque is a vector quantity.	Understand	CLO 2	CAEE007.02
29	Define Break-down Torque.	The Break-down Torque is the highest torque available before the torque decreases when the machine continues to accelerate to working conditions.	Remember	CLO 3	CAEE007.03
30	Define Full load torque or rated torque.	The Full-load Torque is the torque required to produce the rated power of an electrical motor at full-load speed.	Understand	CLO 3	CAEE007.03
31	Define Locked Rotor or Starting Torque.	The Locked Rotor Torque or Starting Torque is the torque an electrical motor develops when starting at zero speed.	Understand	CLO 3	CAEE007.03
32	Define Pull-up Torque	The Pull-up Torque is the minimum torque developed by an electrical motor when it runs from zero to full-load speed (before it reaches the break-down torque point). When a motor starts and begins to accelerate the torque in general will decrease until it reach a low point at a certain speed - the pull-up torque - before the torque increases until it reach the highest torque at a higher speed - the break-down torque - point	Understand	CLO 3	CAEE007.03
UNIT – II					
1	What are the equivalent circuit parameters of an induction motor?	The equivalent circuit parameters of an induction motor are No load resistacne (R_0) No load Reactance (X_0) Stator and rotor resistances (R_1, R_2) Stator and rotor resistances (X_1, X_2)	Remember	CLO4	CAEE007.04
2	What is the rotor reactance under running condition?	The rotor reactance (Xr) of an induction motor under running condition is the slip (S) times the Reactacne of rotor unders standstill condtion (X_2). i.e. $Xr = S* X_2$	Understand	CLO4	CAEE007.04
3	How the mechanical power developed is expressed in equivalent circuit of induction motor?	The mechanical power developed is expressed in equivalent circuit of induction motor as $R_L = R_2*(1-S)/S$	Remember	CLO4	CAEE007.04
4	What is no load test?	It is a test conducted on three phase induction motor under no-load condition.This test is used to find the shunt branch equivalent circuit parameters.	Understand	CLO 4	CAEE007.04
5	What is blocked rotor test?	A blocked rotor test is conducted on an induction motor. It is also known as locked rotor test or stalled torque test. From this test, short circuit current at normal voltage, power factor on short circuit, total leakage reactance, and starting torque of the motor can be found.	Understand	CLO 4	CAEE007.04
6	Classify the losses in induction motor?	The losses of an induction motor are classified into three types. 1. Iron/core losses	Understand	CLO 4	CAEE007.04

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		2. Copper losses 3. Mechnaical Losses			
7	What are the constant losses?	The core losses together with the mechanical losses are called the constant losses because as the motor is loading from noload to full load these losses are constant.	Understand	CLO 4	CAEE007.04
8	What are the variable losses?	The copper losses of an induction motor is also called as variable losses because as the motor is loading from noload to full load these losses will increase and vary.	Understand	CLO 4	CAEE007.04
9	Define efficiency.	The ratio of ouput power to input power is calledthe efficiency.	Remember	CLO 4	CAEE007.04
10	What is the condition for getting maximum efficiency?	The efficiency of induction motor is maximum when the variable losses (copper losses) equal to the constant losses (iron / core losses) of the machine.	Remember	CLO 4	CAEE007.04
11	Define speed regulation	The change in speed of the motor from no load to full load expreesed as a percentage of full load is called the speed regulation of the motor.	Remember	CLO 4	CAEE007.04
12	What is a self starting motor?	Motors which start by themselves by switching in, without addional help, are called self-starting motors.	Understand	CLO 5	CAEE007.05
13	Is induction motor is a self starting motor?	Yes, the induction motor is a self starting motor as when it is connectd to the supply it will start running by itself.	Remember	CLO 5	CAEE007.05
14	Why does an induction motor need a starter?	In an induction motor, when supply is given to the stator windings, the rotating magnetic field flux and the produced flux in the rotor windings due to the back emf, causes the motor torque to increase, causing a high rotor current. During the time between the application of electric supply to the motor and the actual acceleration of the motor to its full speed, a large amount of current is drawn by the stator from the supply. This starting current is about 5 to 6 times more than the full load current. This time duration can be for few seconds or longer. This causes the electrical equipments to damage because of the increasing voltage drop in electrical systems due to flow of larger currents across the cable. For this reason, an induction motor needs a starter at start to reduce the high starting currents.	Understand	CLO 5	CAEE007.05
15	List the different staring methds used for an induction motor.	1. Direct Online (DOL) starter 2. Star-delta starter 3. Auto transformer starter	Remember	CLO 5	CAEE007.05
16	What is a DOL starter?	The simplest form of motor starter for the induction motor is the direct on line starter. The direct on line motor starter (DOL) consist a MCCB or Circuit Breaker, Contactor and an overload relay for protection. Electromagnetic contactor which can be opened by the thermal overload relay under fault conditions	Remember	CLO 5	CAEE007.05
17	What is star delta starter?	The Star Delta Starter is a very common type of starter and is used extensively as compared to the other type of starting methods of the induction motor. A star delta is used for a cage motor designed to run normally on the delta connected stator winding.	Understand	CLO 5	CAEE007.05

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18	Discuss about an autotransformer starter.	An Auto transformer Starter is suitable for both star and delta connected motors. In this method, the starting current is limited by using a three-phase auto transformer to reduce the initial stator applied voltage.	Remember	CLO 5	CAEE007.05
19	Describe the function of over load relay in DOL starter.	DOL starter is also provided with overload relay to protect the motor from overloads. When excessive current flows through the motor, overheating causes to damage the motor winding. The overload coil becomes hot when the over current flows through the motor. This causes to expand bimetallic strip and thereby opens the trip contact	Understand	CLO 5	CAEE007.05
20	Identify where a DOL starter is preffered for stating an an induction motor.	The DOL starter is used for small rating motors upto 5HP only.	Remember	CLO 5	CAEE007.05
21	Identify where a star delta starter preffered over dol starter.	If the motor rating exceeds 5HP, then the the star delta starter is preffered over DOL starter.	Remember	CLO 5	CAEE007.05
22	Difference a soft starter from star delta starter?	The two starter types we are comparing are the star-delta (wye-delta) and a soft starter, and they both limit the voltage on start. The short answer is a soft-starter is more efficient, so use it where you have a large motor that is often starting and stopping. The goal of this method is to reduce the starting voltage.	Remember	CLO 5	CAEE007.05
23	Explain why no load current of induction motor is high?	The magnetic circuit of the induction motor has an air gap and hence higher reluctance as compared to a transformer magnetic circuit having no air gap. To produce a required magnetic field flux density in an induction motor (which is actually lower than that of a transformer) requires much larger exciting current due to this higher reluctance.	Understand	CLO 5	CAEE007.05
24	Explain why the starting current is high in induction motor?	An induction motor during start behaves like a short circuited transformer. Now, when supply is given to the stator windings, it draws high current at constant voltage as the windings are short circuited. This high current through the stator turns generate magnetic field which links with the rotor conductors.	Understand	CLO 5	CAEE007.05
25	List the types of speed control methods in induction motor from stator side.	The following are the speed control methods of induction motor from stator side 1. By changing the supply frequency 2. By changing number of stator poles 3. By changing the supply voltage	Remember	CLO 5	CAEE007.05
26	Identify the various methods of measuring slip?	1. By actual measurement of rotor speed 2. By measurement of rotor frequency 3. Stroboscopic method	Remember	CLO 3	CAEE007.03
27	Define Induction generator	Isolated Induction Generator. Isolated Induction Generator means that an induction machine can work as a generator even without an external supply system. ... A small EMF is induced in the stator at a frequency proportional to the rotor speed.	Understand	CLO 6	CAEE007.06

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28	Define synchronous watt.	A synchronous watt is a new unit of torque and is defined as the torque which develops a power of 1 watt at the synchronous speed of motor.	Remember	CLO 4	CAEE007.04
29	Describe the V/f speed control method of induction motor?	Controlling induction motor speed such as by increasing external resistance to a wound rotor achieve speed control by increasing the slip frequency as a result of the higher rotor resistance circuit. This directly increases the rotor losses which lowers the efficiency.	Understand	CLO 5	CAEE007.05
30	Discuss the cascaded connection of speed control?	In this method of speed control, two motors are used. Both are mounted on a same shaft so that both run at same speed. One motor is fed from a 3phase supply and the other motor is fed from the induced EMF in first motor via slip-rings.	Understand	CLO 5	CAEE007.05
31	List the types of speed control methods in induction motor from rotor side.	The following are the speed control methods of induction motor from rotor side 1. By inserting resistance in rotor circuit 2. By various ways of cascade connection 3. By injecting EMFs in the rotor circuit.	Remember	CLO 5	CAEE007.05
32	Describe about circle diagram.	The Heyland diagram is an approximate representation of circle diagram applied to induction motors, which assumes that stator input voltage, rotor resistance and rotor reactance are constant and stator resistance and core loss are zero.	Understand	CLO 6	CAEE007.06
UNIT – III					
1	What is meant by synchronising the alternators?	The process of connecting two or more alternators in parallel for supplying a common load is called synchronising.	Remember	CLO 10	CAEE007.10
1	What is salient pole rotor?	In alternators salient polerotor is arotorwhich has the projected poles and make the flux in air gap to be non uniform.	Remember	CLO 7	CAEE007.07
3	What is cylindrical rotor?	In alternators cylindrical rotor is a rotor which has the cylindrical type constuction and make the flux in air gap to be uniform.	Remember	CLO 7	CAEE007.07
4	What is damper winding?	The damper winding is an extra winding wound in rotor which is useful in preventing the hunting (momentary speed fluctuations) in synchronous machines. The damper winding also used to maintain balanced 3 phase voltage under unbalanced load conditions.	Remember	CLO 8	CAEE007.08
5	Define voltage regulation.	In electrical engineering voltage regulation is a measure of change in the voltage magnitude from no loadto full load during switching and loading period.	Understand	CLO 9	CAEE007.09
6	What is meant by turbo alternators?	High speed alternators are called as turbo alternators. As it runs at very high speed, salient pole rotors are not used. Smooth cylindrical type rotor is suitable for turbo alternators.	Remember	CLO 7	CAEE007.07

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7	What is direct-connected alternator ?	One in which the alternator and engine are directly connected. In other words, there is no intermediate gearing such as belt, chain etc. Between the driving engine and alternator.	Remember	CLO 7	CAEE007.07
8	Define pole pitch?	The distance between the centres of two adjacent poles is called pole pitch. One pole pitch is equals to 180 electrical degrees. It is also defined as the number of slots per pole.	Remember	CLO 8	CAEE007.08
9	Define coil span.?	The distance between the two coil sides of a coil is called as coil span. It may be expressed in electrical degrees or in number of slots.	Understand	CLO 8	CAEE007.08
10	What is meant by full pitched winding?	If the coil span is equal to pole pitch, the winding is called as full pitched winding.	Understand	CLO 8	CAEE007.08
12	What is meant by short pitched winding?	If the coil span is less than the pole pitch, the winding is called as shotpitched winding. It is also known as shortchorded winding.	Understand	CLO 8	CAEE007.08
13	What is balanced winding?	If under each pole face, there are an equal number of coils of different phases, then the winding is said to be balanced winding. In balanced winding, coil group should be an even number.	Remember	CLO 8	CAEE007.08
14	Whtat is unbalanced winding?	If the number of coils per coil group is not a whole number, the winding is known as unbalanced winding. In such case, each pole face contains unequal of coils of different phase. In two-phase alternator, two single-phase windings are placed on the armature by 90 electrical degrees apart from each other.	Remember	CLO 8	CAEE007.08
15	Define coil group.	It is product of number of phases and number of poles in a rotating machine. Coil group = number of poles × the number of phases.	Remember	CLO 8	CAEE007.08
16	Define integral slot winding.	When the number of slots per pole per phase is an integer, the winding is the integer slot winding but when the number slots per pole per phase is fractional number the winding we refer as fractional slot winding.	Understand	CLO 8	CAEE007.08
17	Define concentrated winding	In these windings the coils are not distributed rather than they are concentratedat one particular slot. That is, the armature poles are equals to the number of armature slots	Remember	CLO 8	CAEE007.08
18	Define distributed winding	The distributed winding is the distribution of conductors each slot equally. The conductors are placed under several slots. The distributed winding reduces the armature reaction and helps in better cooling. In these windings, the induced emf is less, but it is more sinusoidal in nature than concentratedwindings	Remember	CLO 8	CAEE007.08
19	Define single layer winding	When each side of a coil occupies a slot completely without any other coil lying on top of it and the number of coils equals half the number of slots, the winding is known as single layer winding.	Remember	CLO 8	CAEE007.08
20	Define double layer winding	When each side of a coil occupies two coil-sides such a winding is known as a two layer Winding. All the coils of a two-layer winding are of similar shape so that these can be wound separately and then placed in the slots.	Remember	CLO 8	CAEE007.08

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25	What is balanced winding?	If under each pole face, there are an equal number of coils of different phases, then the winding is said to be balanced winding. In balanced winding, coil group should be an even number.	Remember	CLO 8	CAEE007.08
26	Whtat is unbalanced winding?	If the number of coils per coil group is not a whole number, the winding is known as unbalanced winding. In such case, each pole face contains unequal of coils of different phase. In two-phase alternator, two single-phase windings are placed on the armature by 90 electrical degres apart from each other.	Remember	CLO 8	CAEE007.08
27	Define coil group.	It is product of number of phases and number of poles in a rotating machine. coil group = number of poles × the number of phases.	Remember	CLO 8	CAEE007.08
28	Define integral slot winding.	When the number of slots per pole per phase is an integer, the winding is the integer slot winding but when the number slots per pole per phase is fractional number the winding we refer as fractional slot winding.	Remember	CLO 8	CAEE007.08
29	Define fractional slot winding.	Fractional slot winding is practicable only with the double layered winding. It limits the number of parallel circuits available because phase group under several poles must be connected in series before a unit is formed and the widening respects the pattern to give the second unit that can be put in parallel with the first.	Remember	CLO 8	CAEE007.08
30	Define infinite bus	The bus whose voltage and frequency remains constant even after the variation in the load is known as the infinite bus.	Understand	CLO 10	CAEE007.10
31	Why EMF method for calculation voltage regulation is also called as pessimistic method	The EMF method is also called pessimistic method as the value of regulationobtained is much more than the actual value	Understand	CLO 9	CAEE007.09
UNIT - IV					
1	Whatdo you mean by the term synchronous"?	Existing or occurring at the same time.	Remember	CLO 11	CAEE007.11
2	What is an electric motor?	An electric motor is an electrical machine that converts electrical energy into mechanical energy	Remember	CLO 11	CAEE007.11

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3	What is meat by “excitation” in synchronous motor?	Synchronous motor excitation refers to the dc supply given to rotor which is used to produce the required magnetic flux	Remember	CLO 12	CAEE007.12
4	What is power factor?	The ratio of the actual electrical power dissipated by an ac circuit to the product of the r.m.s. values of current and voltage. The difference between the two is caused by reactance in the circuit and represents power that does no useful work.	Remember	CLO 12	CAEE007.12
5	What is a damper winding?	The bars are connected to each other at both ends of the rotor by so called end - rings. Damper windings are used to counteract an asynchronous air- gap flux which can be caused by electrical and mechanical transients. They are also used to bring the machine to synchronous speed in direct -online applications.	Understand	CLO 11	CAEE007.11
6	Why do we give DC excitation to AC synchronous motor?	The DC excitation provides a steady (constant) magnetic field in the rotor. As the rotor spins, the steady field becomes a rotating output. Steady rotor electromagnetic field (from DC excitation) becomes rotating (or AC) output voltage	Understand	CLO 11	CAEE007.11
7	Why synchronous motor is not self starting?	This is because the speed with which rotating magnetic field is rotating is so high that it is unable to rotate the rotor from its initial position, due to the inertia of the rotor. So under any case, whatever may be the starting position of the rotor, synchronous motor is not self starting.	Understand	CLO 11	CAEE007.11
8	How to make synchronous motor self starting?	The synchronous motor is made self starting by providing a special winding on the rotor poles, known as damper winding or squirrel cage winding. AC supply given to the stator produces a rotating magnetic field which causes the rotor to rotate, therefore, in the beginning synchronous motor provided with damper winding starts as a squirrel cage induction motor. The exciter moves along the rotor. When the motor attains about 95% of synchronous speed, the rotor winding is connected to exciter terminals and the rotor is magnetically locked by the rotating field of the stator and the motor runs as a synchronous motor.	Remember	CLO 11	CAEE007.11
9	What methods are generally used to start the synchronous motor?	1. Using pony motors. In this method, the rotor is brought to the synchronous speed with the help of some external device like small induction motor 2. Using Damper Winding 3. As a Slip Ring Induction Motor 4. Using Small D.C. Machine	Remember	CLO 11	CAEE007.11
10	What is the difference between synchronous motor and induction motor?	An induction motor runs a little slower than the applied frequency. The speed of asynchronous motor is fixed by the frequency of the AC system. In induction motor magnetic fields of rotor and stator are rotating in different frequencies. In a synchronous motor, stator field and rotor field are synchronous	Understand	CLO 11	CAEE007.11
11	Why synchronous motor has no starting torque?	The stator carries windings connected to an AC supply to produce a rotating magnetic field at synchronousspeedthe rotor poles lock to the rotating magnetic field, beacause of the constant magnetic field in the rotor these cannot use induction windings for starting.	Remember	CLO 11	CAEE007.11

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12	How does synchronous motor improve power factor?	An over-excited synchronous motor has a leading power factor. This makes it useful for power factor correction of industrial loads. Both transformers and induction motors draw lagging (magnetising) currents from the line.This improves the plant power factor and reduces the reactive current required from the grid.	Understand	CLO 11	CAEE007.11
13	Why there is no slip in synchronous motor?	Because the rotor turns at the same speed as synchronous speed (speed of the rotating magnetic field), there is no slip. The speed of rotation of the motor is constant in a synchronous motor, and does not vary with load, as in an inductionmotor.	Understand	CLO 11	CAEE007.11
14	Why synchronous motors are known as synchronous capacitors?	In electrical engineering, asynchronous condenser (sometimes called asynchronous capacitor or synchronous compensator) is a DC-excitedsynchronous motor, whose shaft is not connected to anything but spins freely.	Understand	CLO 13	CAEE007.13
15	How does synchronous motor improve power factor?	An over-excited synchronous motor has a leading power factor. This makes it useful for power factor correction of industrial loads. Both transformers and induction motors draw lagging (magnetising) currents from the line. This improves the plant power factor and reduces the reactive current required from the grid.	Understand	CLO 13	CAEE007.13
16	Explain how can a synchronous motor be made to have a leading power factor?	Synchronous motors are designed to operate at unity (1.0) power factor or 0.8leading power factor. By varying the DC excitation of the motor, the power factorof the motor can be varied widely. Overexcited synchronous motors operate atleading power factor and provide reactive kVAR like capacitors.	Understand	CLO 13	CAEE007.13
17	What is a “V” curve?	V curve is a plot of the stator current versus field current for different constant loads. The Graph plotted between the armature current I_a and field current I_f at no load the curve is obtained known as V Curve. Since the shape of these curves is similar to the letter “V”, thus they are called V curve of synchronous motor.	Remember	CLO 13	CAEE007.13
18	What is an “inverted V”curve”?	Inverted V curve is a plot of the power factor versus field current for different constant loads. The Graph plotted between the power factor and field current at no load the curve is obtained known as inverted V Curve. Since the shape of these curves is similar invert to the letter “V”, thus they are called inverted V curve of synchronous motor.	Remember	CLO 13	CAEE007.13
19	What is salient pole SYNCHRONOUS motor?	The motor which has its poles projected outside.	Remember	CLO 11	CAEE007.11
20	Describe about synchronous condesor.	In electrical engineering, a synchronous condenser (sometimes called a synchronous capacitor or synchronous compensator) is a dc-excited synchronous motor, whose shaft is not connected to anything but spins freely	Remember	CLO 13	CAEE007.13
21	Describe the hunting phenomena in synchronous motor?	The phenomenon of oscillation of the rotor about its final equilibrium position is called hunting. On the sudden application of load, the rotor search for its new equilibrium position and this process is known as hunting. The hunting process occurs in a synchronous motor as well as in synchronous generators if an abrupt change in load occurs	Remember	CLO 12	CAEE007.12

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
22	What is a pony motor?	A pony motor is a small motorwhich is used to start the synchronous motor. Synchronous motor is a not self-starting nmotor.	Remember	CLO 11	CAEE007.11
23	What is the term"HP" related to motors?	Hp(horse powe) is old imperial unit used to representthe ouput powerofamotor. 1hp = 746w	Remember	CLO 11	CAEE007.11
24	Define SCR.	Short circuit ratio (SCR) is defined as the ratio of field current required to produce rated voltage on open-circuit to field current required to produce rated armature current with the terminals shorted, while the machine runs at synchronous speed.	Remember	CLO 11	CAEE007.11
25	Define pullout torque.	The pullout torque is the torque, beyond which the synchronous link between field poles and resultant flux wave is severed and the machine falls out-of-slip	Remember	CLO 11	CAEE007.11
26	Wht is an over excitation motor?	If the field excitation of the motor is increased, the field flux will become strong and eb will increase. As a result eb will exceed v and the motor will be called an over excited motor.	Remember	CLO 13	CAEE007.13
27	What is accelerating time?	The time required for a motor to reach full speed from standstill (zero speed) position.	Remember	CLO 11	CAEE007.11
28	Explain why do we use synchronous condenser?	In an industrial plant, synchronous motors can be used to supply some of the reactive power required by induction motors. This improves the plant power factor and reduces the reactive current required from the grid. Synchronous condensers are also useful for supporting voltage levels.		CLO 13	CAEE007.13
29	What is a phase modifier?	A synchronous motor that runs without mechanical load, and is provided with means for varying its power factor to simulate a capacitive or inductive reactor; used in voltage regulation of alternating-current power systems.	Understand	CLO 13	CAEE007.13
30	What is meant by phase advancer?	a synchronous or asynchronous machine for supplying leading reactive volt amperes to the system to which it is connected.	Understand	CLO 13	CAEE007.13
UNIT - V					
1	Why is it called a split phase motor?	Split Phase Induction Motor. The Split Phase Motor is also known as a resistance start motor. It has a single cage rotor, and its stator has two windings known as main winding and starting winding. At the starting of the motor both the windings are connected in parallel.	Understand	CLO 14	CAEE007.14
2	What happens when a motor capacitor goes bad?	The most common problem that bad capacitors can cause is "hard starting." This is when the compressor of an AC has difficulty starting up, stutters trying to turn on, and then shuts off a short while later. In most cases of capacitor problems, such as damage or a loss of charge, the capacitor will need to be replaced.	Understand	CLO 14	CAEE007.14
3	What is the use of shading ring in a pole motor**?**	The shading coil causes the flux in the shaded portion to lag behind the flux in unshaded portion of pole. This gives in effect a rotation of flux across the pole face and under the influence of this moving flux a starting torque is developed.	Remember	CLO 14	CAEE007.14

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4	In which direction does a shaded pole motor run?	The rotor starts rotation in the direction from unshaded part to the shaded part.	Remember	CLO 14	CAEE007.14
5	What is size of shaded-pole motor?	These are usually built in small fractional H.P, not exceed 1/4 H.P	Remember	CLO 14	CAEE007.14
6	Differentiate between “capacitor start “and “capacitor start capacitor run“ induction motor?	In capacitor start motor, capacitor is connected in series with the starting winding. But it will be disconnected fro m the supply, when the motor picks up its speed. But in capacitor start capacitor run motor starting winding and capacitor are not disconnected, but always connected in the supply so it has high starting and running torque.	Remember	CLO 14	CAEE007.14
7	Whatis auxilary winding?	The windingwhich is included in the circuit at starting makethe single phase induction motor a self stating motor.	Remember	CLO 14	CAEE007.14
8	Why single phase induction motor does not self starts?	The single-phase stator winding produces a magnetic field that pulsates in strength in a sinusoidal manner. The field polarity reverses after each half cycle but the field does not rotate. Consequently, the alternating flux cannot produce rotation in a stationary squirrel-cage rotor.	Remember	CLO 14	CAEE007.14
9	How to produce rotating magnetic field from 2-phase supply?	As with a 3-phase supply, a 2-phase balanced supply also produces a rotating magnetic field of constant magnitude. With the exception of the shaded-pole motor, all single-phase induction motors are started as 2-phase machine. Once so started, the motor will continue to run on single-phase supply.	Remember	CLO 14	CAEE007.14
10	What is speed variation of split phase induction motor from no load to full load?	An important characteristic of these motors is that they are essentially constant-speed motors. The speed variation is 2-5% from no-load to full- load.	Remember	CLO 14	CAEE007.14
11	Which type of capacitor is used in single phase motor?	A capacitor-start induction motoronly has a capacitor in series with the auxiliary winding during starting. A capacitor-run motor typically has a large non polarizedelectrolytic capacitor in series with the auxiliary winding for starting, then a smaller non-electrolytic capacitor during running.	Remember	CLO 14	CAEE007.14
12	What happens if capacitor is too small?	Motor will not run properly with a weak capacitor. This is not to imply bigger is better, because a capacitor that is too large can cause energy consumption to rise. In both instances, be it too large or too small, the life of the motor will be shortened due to overheated motor windings.	Remember	CLO 14	CAEE007.14
13	What happens when a capacitor fails?	Depending on where the capacitor is connected This will cause the circuit to stop working, it may burn out components and blow a fuse. When capacitor f ils due to open circuit nothing happens but when it fails due to short circuit there might be changes in currents and voltages in the circuit.	Understand	CLO 14	CAEE007.14
14	Why do you need a run capacitor?	Run capacitors some single-phase AC electric motors require a "run capacitor" to energize the second-phase winding (auxiliary coil) to create a rotating magnetic field	Understand	CLO 14	CAEE007.14

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		while the motor is running. If a wrong capacitance value is installed, it will cause an uneven magnetic field around the rotor.			
15	Can I use a bigger capacitor than needed?	Much the same way, a motor will not run properly with a weak capacitor. This is not to imply bigger is better, because a capacitor that is too large can cause energy consumption to rise. There is a maximum of +10% tolerance in microfarad rating on replacement start capacitors, but exact run capacitors must be replaced.	Understand	CLO 14	CAEE007.14
16	Describe a single phase induction motor?	A machine that converts single phase ac electrical power into mechanical power by using a electromagnetic induction phenomenon is called a single phase induction motor.	Remember	CLO 14	CAEE007.14
17	Explain why a single phase induction motor is not a self starting one?	When motor fed supply from single phase, its stator winding produces an alternating flux, which doesn't develop any torque.	Remember	CLO 14	CAEE007.14
18	What is a fractional H.P. Motor?	a small motor having h.p. Less than unit is called fractional h.p. Motor.	Remember	CLO 14	CAEE007.14
19	Which type of rotor is used in single phase motors?	Squirrel cage type	Remember	CLO 14	CAEE007.14
20	Which type of torque is developed in single phase motors?	Pulsating torque is produced.	Remember	CLO 14	CAEE007.14
21	State double revolving field theory.	According to this theory, alternating flux can be resolved into 2 rotating components, which rotates in opposite direction to each other and magnitude of each component is equal to half of the maximum magnitude of alternating flux	Remember	CLO 14	CAEE007.14
22	State cross field theory.	According to cross field theory, the stator flux can be resolved into two components which are mutually perpendicular. One acts along axis of the stator winding and other acts perpendicular to it. Assume now that an initial push is given to the rotor anticlockwise direction.	Understand	CLO 14	CAEE007.14
23	List the methods available for making single phase induction motor a self starting motor?	The methods available for making single phase induction motor a self starting motor are 1. By splitting the single phase 2. by providing shading coil in the poles. 3. Using auxlary winding Using a capacitor	Remember	CLO 14	CAEE007.14
24	How many windings does a single phase motor have?	A typical two-phase AC servo-motor has a squirrel cage rotor and a field consisting of two windings: a constant-voltage (AC) main winding. a control-voltage (AC) winding in quadrature (i.e., 90 degrees phase shifted) with the main winding so as to produce a rotating magnetic field.	Remember	CLO 14	CAEE007.14
25	Illustrate about the starting and running winding.	When the motor is starting, the start up winding is connected to the power source via a centrifugal switch which is closed at low speed. The starting winding is wound with	Understand	CLO 14	CAEE007.14

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		fewer turns of smaller wire than the main winding, so it has a lower inductance (L) and higher resistance (R).			
26	Does the start or run winding have more resistance?	In single phase motor which winding has more resistance. Resistance between running and starting winding of motor. Resistance of single phase motor starting and running coil. resistance of start windings and run windings.	Understand	CLO 14	CAEE007.14
27	What is the purpose of the auxiliary winding in a single phase induction motor?	Single-phase induction motors are not self-starting without an auxiliary stator winding driven by an out of phase current of near 90o. Once started the auxiliary winding is optional. The auxiliary winding of a permanent-split capacitor motorhas a capacitor in series with it during starting and running.	Understand	CLO 14	CAEE007.14
28	Which winding is used in ceiling fan?	Ceiling Fans are direct driven mostly using single-phase Inductionmotor. Motors have windings wound for 18, 20 or 22 poles, resulting in to lower operating speeds (Most common: 18 pole). The rotor resistance is very high for wide speed control range using the stator voltage control.	Remember	CLO 14	CAEE007.14
29	Differentiate the auxiliary winding from the main winding in a split phase motor?	A phase shift with respect to the main current is achieved by using narrow conductors to achieve a high resistance to reactance ratio. ... A split-phase motorhas significantly lower torque at starting than any of the capacitor motors due to the reduced phase angle between main and auxiliary winding currents.	Understand	CLO 14	CAEE007.14
30	Explain the purpose of a capacitor in the split phase motor?	A Capacitor Start Motors are a single phase Induction Motor that employs acapacitor in the auxiliary winding circuit to produce a greater phase difference between the current in the main and the auxiliary windings. The name capacitorstarts itself shows that the motor uses a capacitor for the purpose of the starting.	Understand	CLO 14	CAEE007.14

Signature of the Faculty **Signature of the HOD**