

Lecture Plan -1Faculty:-Semester:- VClass:- EEECourse Code:-EE-311-FSubject:- Electrical Machines II SECTION A

S. No.	Topic : Introduction to induction motor,working principle and construction	Time Allotted:-
1.	Introduction: Induction motor is an a.c. motor .It is also called rotating transformer. Induction motor also works on the principle of mutual induction.It is of two types – single phase and three phase.	<u>10 min</u>
2	Division of the Topic <ul style="list-style-type: none"> - Definition of induction motor - Working principle of induction motor. - Types of induction motor. - Construction of transformer 	<u>30 min</u>
3.	Conclusion: The induction motor is of two types –3 phase and single phase,3-phase induction motor is self starting .When we supply the three phase a.c. in stator ,it produces the revolving flux, which in turn moves the rotor .	<u>5 min</u>
4	Question / Answer: Q1 What are the different types of 3-phase induction motor. A1 Squirrel cage induction motor and slip ring induction motor. Q2 Is the 3-phase induction motor self starting? A2 yes.	<u>5 min</u>

Assignment to be given:-

Assignment 1

Q1 Explain the working principle and construction of transformer.

Q2 What do you mean by efficiency of transformer ,derive the condition for maximum efficiency.

Q3 Explain the different losses in transformer

Q4 Explain the working principle and construction of induction motor.

Reference Readings:-

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
-

Lecture Plan -2

Faculty:- Semester:- V Class:- EEE Course Code:-EE-311-F

Subject:- Electrical Machines II SECTION A

S. No.	Topic : Types of I.M. and equivalent circuit of induction motor.	Time Allotted:-
1.	Introduction: Different types of induction motor on the basis of construction, the equivalent circuit of induction motor showing the different resistances and reactances of induction motor with losses.	<u>10 min</u>
2	Division of the Topic - Types of induction motor - Primary side resistance and reactances - Secondary side resistances and reactances - Total equivalent circuit.	<u>30 min</u>
3.	Conclusion: The 3-phase induction motor is slip ring and squirrel cage type. The slip ring induction motor is more useful for speed control purposes as additional resistance can be connected in slip ring induction motor.	<u>5 min</u>
4	Question / Answer: Q1 Which kind of supply is given to stator and rotor in case of induction motor? A1 3-phase to stator and no supply to rotor. Q2 What is the speed of stator flux? A2 Synchronous speed.	<u>5 min</u>

Assignment to be given:-NIL

Reference Readings:-

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
- Electrical machines By Nagrath and Kothari
-

Lecture Plan-3

Faculty:-

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic	Construction of Induction motor and different types	Time Allotted:-
1.	Introduction : Main parts of induction motor,making of stator and rotor, different types Of induction motor.		10 min
2	Division of the Topic - Construction of stator and rotor - Stator core and stator windings - Rotor core and rotor windings - Slip Ring I.M. - Squirrel cage I.M.		30 min
3.	Conclusion Slip ring induction motor is more useful for different speed ranges, specially for variable speed ranges.As an additional resistance can be added in case of Slip ring induction motor.		5 min
4	Question / Answer Q Which is the suitable type for variable speed? A Slip ring induction motor. Q What is the speed of induction motor? A It is always less than synchronous speed.		5 min

Assignment to be given:-NIL

Reference Readings:-

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
- Electrical machines By Nagrath and Kothari
-

Lecture Plan -4Faculty:-Semester:-VClass:-EEECourse Code:-EE-311-FSubject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic	Time Allotted:-
1.	Torque slip characteristics of I.M. Introduction : Concept of slip, torque, synchronous speed and torque slip characteristics and inferences from torque slip characteristics	10 min
2	Division of the Topic <ul style="list-style-type: none"> - Slip - Synchronous speed - Torque equation - Torque slip char. of I.M. - Variation in char. due to change in resistance - Change in max. torque - 	30 min
3.	Conclusion The torque first increases with slip and then decreases with slip. The max torque remains same at all the values of rotor resistances .But the slip corresponding to max torque decreases with increase in resistance.	5 min
4	Question / Answer Q What is slip speed? A It is the difference in synchronous speed and rotor speed Q What is the condition of maximum torque? A Rotor resistance=Rotor Reactance.	5 min

Assignment to be given:-NILReference Readings:-

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
- Electrical machines By Nagrath and Kothari
-

Lecture Plan -5

Faculty:-

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic Rotor resistance and equivalent circuit of induction motor.	Time Allotted:-
1.	Introduction : The equivalent circuit of induction motor represents the stator resistance and stator Reactance, rotor resistance and rotor reactance along with the load resistance. The rotor reactance depends on the slip conditions of motor.	10 min
2	Division of the Topic - Stator reactance - Rotor reactance - Load resistance - Dependence on the slip	30 min
3.	Conclusion The equivalent circuit is the representation of induction motor components, various losses and load resistance	5 min
4	Question / Answer Q Does the Load resistance in case of I.M. depends on speed of motor. A Yes Q What is the maximum value of slip? A One.	5 min

Assignment to be given:-NIL

Reference Readings:-

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
- Electrical machines By Nagrath and Kothari
-

Lecture Plan-6

Faculty:-

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic Starting and speed control methods for three phase I.M.	Time Allotted:-
1.	Introduction : Special method of starting is used for three phase I.M. as the initial inrush current can be very high.Speed control methods can be employed for different speeds.	10 min
2	Division of the Topic - Need of starters in I.M. - Three point starter - Four point starter - Rotor side speed control method - Stator side speed control methods	30 min
3.	Conclusion To decrease the initial inrush current starters are used, stator and rotor side speed control methods are used for speed control.	5 min
4	Question / Answer Q 1 Why the starters are used in 3-phase I.M. A To decrease the initial inrush current Q2 Name the different speed control methods A2 Autotransformer method, rotor rheostat method , star Delta method.	5 min

Assignment to be given:-NIL

Reference Readings:-

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
- Electrical machines By Nagrath and Kothari
-

Lecture Plan-7

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic POWER FLOW DIAGRAM OF AN 3 PHASE INDUCTION MOTOR	Time Allotted:-
1.	Introduction : Power flow diagram describes how input power is converted into mechanical power following certain stages.	10 min
2	Division of the Topic -Stator input -Rotor input - Mechanical power	30 min
3.	Conclusion Rotor iron losses are negligible as slip is too low .	5 min
4	Question / Answer Q 1 What's the ratio of stator input and rotor input? A. Slip	5 min

Assignment to be given:-NIL

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

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Lecture Plan-8

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic PHASOR DIAGRAM OF INDUCTION MOTOR	Time Allotted:-
1.	Introduction : Phasor diagram of 3 phase I.M is same as that of transformer except slip which is used in I.M	10 min
2	Division of the Topic -Complete phasor diagram	30 min
3.	Conclusion The phasor diagram not only discusses I.M characteristics but also the slip's importance.	5 min
4		5 min

Assignment to be given:-NIL

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan-9

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION A

S. No.	Topic INDUCTION GENERATOR	Time Allotted:-
1.	Introduction : When slip is negative the induction machine act as a generator. .	10 min
2	Division of the Topic -Construction - Torque slip characteristics - Power equation	30 min
3.	Conclusion Practically Induction generator has no such use as compared to Induction motor	5 min
4	Question / Answer Q 1 Why slip is negative in 3phase Induction generator ? A .Slip is negative because rotor speed is more than synchronous speed.	5 min

Assignment to be given:-NIL

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan-10

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION B

S. No.	Topic Working principle of 1-phase I.M.	Time Allotted:-
1.	Introduction : Single phase induction motor is not self starting , it can be started by splitting the single phase in two phases .	10 min
2	Division of the Topic -Revolving theory -Cross field theory	30 min
3.	Conclusion The single phase induction motor is not self starting as the single phase produces the pulsating flux.,the single phase is divided in two phases as it produces the revolving flux.	5 min
4	Question / Answer Q 1 Is the single phase induction motor self starting ? A No.	5 min

Assignment to be given:-NIL

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan-11

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION B

S. No.	Topic: Different methods of splitting a single phase	Time Allotted:-
1.	Introduction : Single phase induction motor cannot produce rotating field so below methods are used to create rotating field.	10 min
2	Division of the Topic -Stator and rotor windings in single phase I.M. -Splitting of phases - Capacitor starting - Resistance starting - shading Ring	30 min
3.	Conclusion To create a phase difference and to get rotating field the above methods are used.	5 min
4	Question / Answer Q What are the various methods for splitting the single phase to two phase? A capacitor start method, resistance start method and shading ring	5 min

Assignment to be given:-NIL

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan-12

Semester:-V

Class:-EEE

Course Code:-EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION B

S. No.	Topic	Time Allotted:-
1.	Capacitor start and run type of single phase I.M Introduction : Capacitor start type of single phase I.M is connected at starting and as soon as the the motor picks up the speed near by 80%, capacitor is disconnected whereas the capacitor is connected permanently	10 min
2	Division of the Topic - Capacitor start starting - Capacitor run starting	30 min
3.	Conclusion To create the smooth functioning of rotating field the above methods are used	5 min
4	Question / Answer Q 1 Is the capacitor is connected permanently in start type single phase induction motor ? A No.	5 min

Assignment to be given:-NIL

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan- 13

Faculty:- Semester: V Class:-EEE Course Code:-EE-311-F

Subject:-ELECTRICAL MACHINES II SECTION B

S. No.	Topic :-Servo motor , Universal motor and reluctance motor	Time Allotted:-
1.	Introduction Working principle of Servo motor , Universal motor and reluctance motor. Working of all the motors with neat diagram.	<u>10MIN</u>
2	Division of the Topic <ul style="list-style-type: none">- Working principle of Servo motor , Universal motor and reluctance motor.- Construction of all above motors- Applications of motors	<u>30 MIN</u>
3.	Conclusion Servo motor is used for high speed and low torque applications .Universal motor is used as all types of motors.	<u>5 MIN</u>
4	Question /Answer Q1 Give any two applications of stepper motor? A1 Packaging industry and tape recorder. Q2 Give the applications of servo motor. A2 Mixer , drilling machine	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan -14

Faculty name

Semester:-V

Class:-EEE

Course Code:- EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION C

S. No.	Topic:-Basic theory of Synchronous generator	Time Allotted:-
1.	Introduction In Synchronous machines the windings are either concentrated or distributed winding.	10minutes
2	Division of the Topic -Concentrated winding -Distributed winding	30 minutes
3.	Conclusion In distributed winding less EMF is obtained but waveform is much is nearer to sinusoidal wave.	5 minutes
4	Question / Answer Q1.What is the advantage of using concentrated winding? A1. Maximum EMF is obtained	5 minutes

Assignment to be given:- NIL

Reference Readings:

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja
- Electrical machines By Nagrath and Kothari
-

Lecture Plan 15Faculty nameSemester:-VClass:-EEECourse Code:- EE-311-FSubject:- ELECTRICAL MACHINES IISECTION C

S. No.	Topic:-	Time Allotted:-
1.	Introduction In general generated e.m.f. $E_g = K_d * K_p * N_f \Phi$	10 minutes
2	Division of the Topic --Pitch factor -Distribution factor -	30 minutes
3.	Conclusion Pitch factor is cosine of chording angle	5 minutes
4	Question / Answer Q1.In a Synchronous generator, the generated e.m.f is directly proportional to the -----. A1.Pole flux (Φ). Q2.In lap winding, the number of parallel paths is equal to the -----. A2.Number of poles.	5 minutes

Assignment to be given:-NilReference Readings:

- A text book in electrical technology(vol II)
- By B.L. Theraja an

Lecture Plan16Faculty nameSemester:-VClass: EEECourse Code:- EE-311-FSubject:- ELECTRICAL MACHINES II

SECTION C

S. No.	Topic:-Basic theory of synchronous generator.	Time Allotted:-
1.	Introduction In synchronous machines, the field winding is provided on rotor & the armature winding is provided on the stator. The field winding is always energized from the dc source. Synchronous machines are of two types depending upon the geometrical structure of the rotor, viz.,(a) Salient - pole type (b) Cylindrical rotor type.	10minutes
2	Division of the Topic -Basic theory of synchronous generator -Salient-pole -Cylindrical rotor type	30 minutes
3.	Conclusion The synchronous machines are doubly excited energy-conversion devices.	5 minutes
4	Question / Answer Q1.In synchronous machines the field winding is energized from-----. A1.D.C supply. Q2.What are the two types of synchronous machines? A2.(a) Salient - pole type (b) Cylindrical rotor type.	5 minutes

Assignment to be given:-Reference Readings:

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja

Lecture Plan 17

Faculty name

Semester:-V

Class:- EEE

Course Code:- EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION C

S. No.	Topic:- Armature MMF at different loads.	Time Allotted:-
1.	Introduction Armature mmf is demagnetizing in inductive load whereas magnetizing at capacitive load	10minutes
2	Division of the Topic - Armature mmf at resistive, inductive and capacitive loads -phasor diagram	30 minutes
3.	Conclusion Since most of the loads are inductive so armature mmf is demagnetizing.	05 minutes
4	Question / Answer Q1. Why armature mmf is demagnetizing in nature A Due to inductive load	05 minutes

Assignment to be given:- Nil

Reference Readings:

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja

Lecture Plan- 19**Faculty:-****Semester: V****Class:-EEE****Course Code:-EE-311-F****Subject:-ELECTRICAL MACHINES II****SECTION C**

S. No.	Topic :-Effect of changing the load at constant excitation ,regulation.	Time Allotted:-
1.	Introduction As the load changes at constant excitation the load angle changes and resultant voltage also changes ,so the armature current and torque developed also changes along with the power factor.	<u>10MIN</u>
2	Division of the Topic - Regulation	<u>30 MIN</u>
3.	Conclusion The change in load with constant excitation results in change in torque developed Along with change in power factor. So the load angle has to be changed to get the desired power.	<u>5 MIN</u>
4	Question /Answer Q1 What is power factor? A1 Power factor is the cosine of angle between current and voltage. Q2 What do you mean by normal excitation? A2 When $E_b=V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan- 20**Faculty:-****Semester: V****Class:-EEE****Course Code:- EE-311-F****Subject:-ELECTRICAL MACHINES II****SECTION C**

S. No.	Topic :-Effect of changing the excitation at constant load.	Time Allotted:-
1.	Introduction As the excitation changes at constant load the load angle changes and resultant voltage also changes ,so the armature current and torque developed also changes along with the power factor.	<u>10MIN</u>
2	Division of the Topic - Effect of increasing the excitation at constant load - Effect of decreasing the excitation at constant load	<u>30 MIN</u>
3.	Conclusion The change in excitation with constant load results in change in torque developed Along with change in power factor. So the load angle has to be changed to get the desired power.	<u>5 MIN</u>
4	Question /Answer Q1 What is power factor? A1 Power factor is the cosine of angle between current and voltage. Q2 What do you mean by over excitation? A2 When $E_b > V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan- 21

Faculty:-

Semester: V

Class:-EEE

Course Code:-EE-311-F

Subject:-ELECTRICAL MACHINES II

SECTION C

S. No.	Topic :-comparison of induction and synchronous machine	Time Allotted:-
1.	Introduction Difference in working principles of both the machines .	<u>10min</u>
2	Division of the Topic <ul style="list-style-type: none">- Synchronous machine- Induction machine- Comparison of two machines	<u>30 min</u>
3.	Conclusion Synchronous machine can run only on the synchronous speed and Induction motor runs at the speed less than the synchronous speed.	<u>5 MIN</u>
4	Question /Answer Q1 Which supply is given to the rotor of the synchronous motor? A1 DC supply Q2 What do you mean by under excitation? A2 When $E_b < V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan- 22

Faculty:-

Semester: V

Class:-EEE

Course Code:-EE-311-F

Subject:-ELECTRICAL MACHINES II

SECTION C

S. No.	Topic: Applications of induction and synchronous motor	Time Allotted:-
1.	Introduction Difference in working principles of both the motors and applicatios	<u>10MIN</u>
2	Division of the Topic - Applications of Induction motor - Applications of Synchronous motor	<u>30 MIN</u>
3.	Conclusion Synchronous motror can run only on the synchronous speed and Induction motor runs at the speed less than the synchronous speed.	<u>5 MIN</u>
4	Question /Answer Q1 Which supply is given to the stator of the synchronous motor? A1 3-phase a.c. supply Q2 What do you mean by under excitation? A2 When $E_b < V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan- 23**Faculty:-****Semester: V****Class:-EEE****Course Code:-EE-311-F****Subject:-ELECTRICAL MACHINES II****SECTION C**

S. No.	Topic :-Stepper motor and its applications	Time Allotted:-
1.	Introduction Working principle of stepper motor and step angle	<u>10MIN</u>
2	Division of the Topic - Working principle of stepper motor - Step angle - Working of stepper motor	<u>30 MIN</u>
3.	Conclusion Stepper motor is used for the fine speed control methods like in tape recorder and packaging industry.	<u>5 MIN</u>
4	Question /Answer Q1 Give any two applications of stepper motor? A1 Packaging industry and tape recorder. Q2 What do you mean by under excitation? A2 When $E_b < V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan24

Faculty name

Semester:-V

Class:EEE

Course Code:- EE-311-F

Subject:- ELECTRICAL MACHINES II

SECTION D

S. No.	Topic:-Basic theory of synchronous motor.	Time Allotted:-
1.	Introduction In synchronous machines, the field winding is provided on rotor & the armature winding is provided on the stator. The field winding is always energized from the dc source. Synchronous machines are of two types depending upon the geometrical structure of the rotor, viz.,(a) Salient - pole type (b) Cylindrical rotor type.	10minutes
2	Division of the Topic -Basic theory of synchronous motor -Salient-pole -Cylindrical rotor type	30 minutes
3.	Conclusion The synchronous machines are doubly excited energy-conversion devices.	5 minutes
4	Question / Answer Q1.In synchronous machines the field winding is energized from-----. A1.D.C supply. Q2.What are the two types of synchronous machines? A2.(a) Salient - pole type (b) Cylindrical rotor type.	5 minutes

Assignment to be given:-

Reference Readings:

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja

Lecture Plan 25Faculty nameSemester:-VClass:- EEECourse Code:- EE-311-FSubject:- ELECTRICAL MACHINES II

SECTION D

S. No.	Topic:-Construction of V-Curves	Time Allotted:-
1.	Introduction The V-curves of a synchronous motor show how armature current varies with its field current when motor input is kept constant .These are obtained by plotting ac armature current against dc field current while motor input is kept constant & so called because of their shape.	10minutes
2	Division of the Topic - Construction of V-Curves	30 minutes
3.	Conclusion These are obtained by plotting ac armature current against dc field current while motor input is kept constant.	05 minutes
4	Question / Answer Q1.Define V-Curves. A1.These curves are obtained by plotting the armature current against field current. Q2.While drawing the V-curves, which quantity is kept constant. A2.Motor input.	05 minutes

Assignment to be given:- NilReference Readings:

- A text book in electrical technology(vol II)
- By B.L. Theraja and A.K. Theraja

Lecture Plan-26**Faculty:-****Semester: V****Class:-EEE****Course Code:-EE-311-F****Subject:-ELECTRICAL MACHINES II****SECTION D**

S. No.	Topic : Emf equation of Synchronous motor and effect of changing the excitation at constant load	Time Allotted:-
1.	Introduction When the excitation is changed and load is kept constant the load angle changes and so the power developed , in order to get the desired power we have to change the load angle.	<u>10MIN</u>
2	Division of the Topic - EMF equation of the synchronous motor - The various types of excitations	<u>30 MIN</u>
3.	Conclusion The load angle may increase or decrease according to the load conditions variation and the power developed changes. To get the desired power we have to increase or decrease the excitation current.	<u>5 MIN</u>
4	Question /Answer Q1 What do you mean by load angle? A1 The load angle is the angle between excitation current and load current. Q2 What is the effect of decreasing current at constant load? A2 The load angle increases and the power developed is more than the desired power.	<u>5 MIN</u>

Assignment 4**Q1 Explain** the working principle and construction of synchronous machine.**Q2** What do you mean by load angle?**Q3** What is the effect of decreasing the load at constant excitation?**Q4** What is the effect of increasing the excitation at constant load?

Lecture Plan- 27

Faculty:-

Semester: V

Class:-EEE

Course Code:-EE-311-F

Subject:-ELECTRICAL MACHINES II

SECTION D

S. No.	Topic :-Effect of changing the load at constant excitation ,regulation ,synchronous condenser	Time Allotted:-
1.	Introduction As the load changes at constant excitation the load angle changes and resultant voltage also changes ,so the armature current and torque developed also changes along with the power factor.	<u>10MIN</u>
2	Division of the Topic <ul style="list-style-type: none">- Regulation- Synchronous condenser- Effect of increasing the load at constant excitation- Effect of decreasing the load at constant excitation	<u>30 MIN</u>
3.	Conclusion The change in load with constant excitation results in change in torque developed Along with change in power factor. So the load angle has to be changed to get the desired power.	<u>5 MIN</u>
4	Question /Answer Q1 What is power factor? A1 Power factor is the cosine of angle between current and voltage. Q2 What do you mean by normal excitation? A2 When $E_b=V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**

Lecture Plan- 28**Faculty:-****Semester: V** **Class:-EEE****Course Code:- EE-311-F****Subject:-ELECTRICAL MACHINES II****SECTION D**

S. No.	Topic :-Synchronous condenser.	Time Allotted:-
1.	Introduction When synchronous motor works at no load then it provide leading power factor	<u>10MIN</u>
2	Division of the Topic - Phasor diagram	<u>30 MIN</u>
3.	Conclusion Synchronous condenser is used in power system where it is used to compensate lagging power factor.	<u>5 MIN</u>
4	Question /Answer Q1 What is power factor? A1 Power factor is the cosine of angle between current and voltage. Q2 What do you mean by over excitation? A2 When $E_b > V$	<u>5 MIN</u>

Assignment to be given:-Nil

Reference Readings:-

- **Electrical machine Analysis by Nagrath and Kothari**
- **A text book in electrical technology by B.L. theraja (Vol II)**