Ref No:

<SKIT, Bangalore>

COURSE PLAN

Academic Year 2019-20

Program:	B E – Electrical and Electronics Engineering
Semester :	4
Course Code:	18EE44
Course Title:	Electric Motors
Credit / L-T-P:	4 / 4-0-0
Total Contact Hours:	50
Course Plan Author:	Shweta B

Academic Evaluation and Monitoring Cell

< Inst Address>
<PLACE – PIN, STATE, INDIA>
<Phone / Fax :+91-STD- ……., ……. >
<Web: , e-mail: >

Table of Contents

Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	EE
Semester:	4	Academic Year:	2019-20
Course Title:	ELECTRIC MOTORS	Course Code:	18EE44
Credit / L-T-P:	4 / 4-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	50 Hours	SEE Marks:	60 Marks
CIA Marks:	40 Marks	Assignment	1 / Module
Course Plan Author:	SHWETA B	Sign ..	Dt:
Checked By:		Sign ..	Dt:
CO Targets	CIA Target : ..... %	SEE Target:	..... %

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	DC Motors: Classification, Back emf, Torque equation, and significance of back emf, Characteristics of shunt, series & compound motors. Speed control of shunt, series and compound motors. Application of motors. DC motor starters –3 point and 4 point Losses and efficiency-Losses in DC motors, power flow diagram,efficiency, condition for maximum efficiency	10	Characteristics and operation DC motor	UnderstandL2, Analyze L4
2	Testing of dc motors: Direct & indirect methods of testing of DC motors-Brake test, Swinburne's test, Retardation test, Hopkinson's test, Field's test, merits and demerits of tests Three phase Induction motors: Review of concept and generation of rotating magnetic field, Principle of operation, construction, classification and types; squirrel-cage, slip-ring (No question shall be set from the review portion). Slip, Torque equation, torque-slipcharacteristic covering motoring, generating and braking regions of operation, Maximum torque, significance of slip	10	Testing in DC motors	Apply L3, Understand L2
3	Performance of three-phase Induction Motor: Phasor diagram of induction motor on no-load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the circle diagram and equivalent circuit. Cogging and crawling High torque rotors-double cage and deep rotor bars. Equivalent circuit and performance evaluation of double cage induction motor. Induction motor working as induction motor; standalone operation and grid connected operation.	10	Working andCharacteristics of Induction motor	Apply L3, Apply L3
4	Starting and speed Control of Three-phase Induction Motors: Need for starter. Direct on line, Star-Delta and autoDC MOTOR starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods Single-phase Induction Motor: Double revolving field theory and principle of	10	Starting methods of induction motor	Apply L3, Analyze L4

	operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors.Comparison of single phase motors and applications.			
5	Synchronous motor: Principle of operation, phasor diagrams, torque and torque angle, Blondel diagram, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condenser, hunting and damping. Methods of starting synchronous motors Other motors:Construction and operation of Universal motor, AC servomotor, Linear induction motor and stepper motors.	10	Characteristics of Synchronous Motor	UnderstandL2, Understand L2
-	**Total**	**54**	**-**	**-**

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2, 3, 4, 5	Electrical Machines – I J nagaranth khothari TMH Publication, 2nd, 2010.	3, 4	In Lib / In Dept
1, 2, 3, 4, 5	Electrical machines –J B Gupta, Pearson Education.	2, 4	In Lib/ In dept
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2, 3, 4, 5	Electrical Machines– B L Thereja, John Wiley India Pvt. Ltd. 3rdEdn, 2008.	?	In Lib
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
C1	Working of Klystron Oscillator https://www.youtube.com/watch?v=Fvud81pYGOg – 15 Mins https://www.youtube.com/watch?v=TsBTI3tO5-8 – 5 Mins		
C2			
C3			
C4			
C5			
	Lab : https://www.youtube.com/watch?v=P9e7hUNPGVs -		
D	**Software Tools for Design**	**-**	**-**
	Klystron Oscillator - Vsim - https://www.txcorp.com/ -		
	Stripline - http://www.atlantarf.com/Stripline.php		
E	**Recent Developments for Research**	**-**	**-**
	Improve efficiency - https://ieeexplore.ieee.org/abstract/document/6891996		

F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**
1	How Electron / Vacuum Tubes work ? https://www.youtube.com/watch?v=nA_tglygvNo		
?			

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	-17EE23	Basic Electrical Engineering	Basic operation of Transformer / D C Generator	-	Gap A seminar on Transformer	Understand L2

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
1	Basic operation of DC Motor / Induction /motor	Higher Study	Gap A seminar on DC Motor	Understand L2
3				
3				
5				
-				
-				

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	18EE44.1	Ideal,On load, No load Characteristics, of DC motor all day efficiency	05	Characteristics and operation	Lecture	Slip Test	Understand L2
1	18EE44.2	Three phase Induction motor different winding connection star-Delta Delta-star Y-Y	05	Winding connection	Lecture/ Tutorial	Assignment	Analyze L4

2	18EE44.3	Conditions for load sharing,Load sharing In similar and dissimilar DC motor	06	Load sharing	Lecture	Assignment	Apply L3
2	18EE44.4	Equivalent circuit of DC Motor, derivation of copper saving, efficiency and voltage regulation	06	Copper saving in DC Motor	Lecture	Slip Test	UnderstandL2
3	18EE44.5	Necessity of tertiary winding equivalent circuit and connection	07	Working of Tertiary winding	Lecture	Slip test	Apply L3
3	18EE44.6	Armature reaction of AC and DC and Commutation of generation numericalon motor	06	Characteristics of DC motors	Lecture/Tutorial	Assignment	Apply L3
4	18EE44.7	Harmonics of Synchronous motor Equivalent circuit	06	Operation of AC motors	Lecture/Tutorial	Assignment	L3
4	18EE44.8	Load and No load characteristics Excitation for motor,load sharing	07	Characteristics of AC motors	Lecture/Tutorial	Assignment	Analyze L4
5	18EE44.9	Open circuit and short circuit test, V curves and inverted V curves , Voltage regulation	07	Test on Synchronous motors	Lecture	Assignment	Understand L2
5	18EE44.10	Capability curve of motors, Hunting and different methods to minimize hunting	06	Hunting in AC motors	Lecture	Assignment	Understand L2
-	**-**	**Total**	**62**	**-**	**-**	**-**	**L2-L4**

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level

1	Used in Industries	CO1	L2
1	Understanding Power generation	CO2	L4
2	Used in domestic purpose	CO3	L3
2	Use Backtracking technique for searching a set of solutions or for searching an optimal solution	CO4	L2
3	Apply characteristics of different rating of DC motor	CO5	L2
3	Apply characteristics of different rating of Induction motor	CO6	L3
4	Evaluate starting of motors	CO7	L3
4	Apply different methods to get efficiency of a machine	CO8	L4
5	Able to solve different faults in DC motor and induction motor	CO9	L2
5	Able to solve numericals for different parameters	CO10	L2

4. Articulation Matrix

CO – PO Mappingwith mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes														-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	18EE44.1	Ideal,On load, No load Characteristics, of DC motor all day efficiency	2.5	2.5							2.5							L2
1	18EE44.2	Tests on DC motors	2.5	2.5							2.5							L2
2	18EE44.3	Conditions for load sharing,Load sharing In similar and dissimilar DC motor	2.5	2.5							2.5							L2
2	18EE44.4	Equivalent circuit of auto dc motor,derivation of copper saving, efficiency and voltage regulation	2.5	2.5							2.5							L3
3	18EE44.5	Necessity of tertiary winding equivalent circuit and connection	2.5	2.5							2.5							L2
3	18EE44.6	Armature reaction of AC and DC and Commutation of generation numericalon motor	2.5	2.5							2.5							L2
4	18EE44.7	Harmonics of Synchronous motor Equivalent	2.5	2.5							2.5							L3

		circuit																
4	18EE44.8	Load and No load characteristics Excitation for motor,load sharing	2.5	2.5							2.5							L2
5	18EE44.9	Open circuit and short circuit test, V curves and inverted V curves , Voltage regulation	2.5	2.5							2.5							L2
5	18EE44.1	Ideal,On load, No load Characteristics, of DC motor all day efficiency	2.5	2.5							2.5							L3
-	**CS501PC**	**Average attainment (1, 2, or 3)**	2.5	2.5							2.5							**-**
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*																

5. Curricular Gap and Content

Topics &contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	Transformer	Seminar	2nd week / date	DrManjunath A, Inst	List from B4 above
2					
3					
4					
5					

6. Content Beyond Syllabus

Topics &contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	Application in Different industries	Placement, GATE, Higher Study, Entrepreneurship.	Presentation by students & Mini Project	3rd week / date	Dr ABC, Inst. Self	List from B4 above
1	Induction motor		Presentation		Self	
2						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Voltage regulation and its significance.Three-phase Induction Motor	12	5	-	-	1	1	2	CO1, CO2	L2, L4
2	Operation and Effects of saliency in synchronous Motor	7	3	-	-	1	1	2	CO3, CO4	L3,L2
3	two-reaction theory of synchronous Motor	12	-	3	-	1	1	2	CO5, CO6	L3,L3
4	Direct and Quadrature reactance	13	-	6	-	1	1	2	CO7, C08	L3,L4
5	Voltage regulation and its significance.Three-phase Induction Motor	10	-	-		1	1	2	CO9, CO10	L2,L2
-	**Total**	**54**				**5**	**5**	**10**	**-**	**-**

2.Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	15	CO1, CO2, CO3,Co4	L2,L4,L3,L2
3, 4	CIA Exam – 2	15	CO5, CO6, CO7,C08	L2,L3,L3,L4
5	CIA Exam – 3	15	CO9, CO10	L2,L2
1, 2	Assignment - 1	05	CO1, CO2, CO3,Co4	L2,L4,L3,L2
3, 4	Assignment - 2	05	CO5, CO6, CO7,C08	L2,L3,L3,L4
5	Assignment - 3	05	CO9, CO10	L2,L2
1, 2	Seminar - 1		-	-
3, 4	Seminar - 2		-	-
5	Seminar - 3		-	-
1, 2	Quiz - 1		-	-
3, 4	Quiz - 2		-	-
5	Quiz - 3		-	-
1 - 5	Other Activities – Mini Project	-	CO9, CO10	L2,L2
	Final CIA Marks	**20**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Microwave Tubes And Microwave Transmission Lines	Appr Time:	12 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Understand the working of DC motor	CO1	L2
2	Understand the NO-load and ON-load	CO2	L4
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	DC Motors: Classification, Back emf, Torque equation,,	CO1	L2
2	, Characteristics of shunt, series & compound motors	CO1	L2
3	Speed control of shunt, series and compound motors. Application of motors	CO1	L2
4	DC motor starters –3 point and 4 point	CO1	L2
5	Losses in DC motors.	CO1	L2
6	power flow diagram,efficiency	CO2	L2
7	dc motor connection for three phase operation – zigzag/star and V/V, choice of connection	CO2	L2
8	condition for maximum efficiency	CO2	L4
9	significance of back emf	CO2	L4
10	DC Motors: Classification, Back emf, Torque equation,,	CO2	L4
11	Characteristics of shunt, series & compound motors	CO2	L3
12	Speed control of shunt, series and compound motors. Application of motors	CO2	L3
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Use to find characteristics of DC Motor	CO1	L2
2	Efficiency of DC Motor in industrial applications	CO2	L4
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Explain the reason for tap changing in DC Motor. State on which winding the taps are provided & why?	CO1	L2
2	Explain with neat sketch the construction of t.	CO1	L2
3	Derive an torque equation for a D C motor.	CO1	L2
4	Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load	CO2	L2
5	Explain open-delta connection with the help of neat diagram. Show that open-delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection.	CO2	L2
6	Show the terminal connections of a three-phase dc motor with phasor diagram and corresponding clock method representation 1)Dd0 2) Yy6 3) Dy1 4) Yd11	CO2	L2
7	A 50KVA, 4400/220V, dc motor has R_1=3.45Ω,R_2=0.009Ω, The Values of reactance's areX_1=5.2Ω,X_2=0.015Ω, calculate for the dc motor (i) Equivalent resistance as referred to primary ii)Equivalent resistance as referred to secondary iii) Equivalent reactance as referred to both primaryand secondary iv) Total copper loss, first using individual resistances of the windings and secondly, using equivalent resistances as referred to each side v) Equivalent impedance referred to both sides.	CO2	L2
8	A 25KVA single phase dc motor has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50Hz .Calculate i) Primary and secondary currents on full load ii) Secondary EMF iii) Maximum flux in the core	CO2	L2
9	Derive an equation for a single phase dc motor .Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load.	CO2	L2

10	A 25KVA single phase dc motor has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50Hz .Calculate i) Primary and secondary currents on full load ii) Secondary EMF iii) Maximum flux in the core	CO2	L2
11	Explain line impedance and admittance?	CO2	L2
12	Explain the reason for tap changing in DC Motor. State on which winding the taps are provided & why?	CO2	L3
13	Explain with neat sketch the construction of t.	CO2	L4
e	**Experiences**	-	-
1		CO1	L2
2			
3			
4		CO2	L3
5			

Module – 2

Title:	Microwave network theory and Microwave passive devices	Appr Time:	7 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Parallel operation of dc motors	CO3	L3
2	Connection of 3 phase dc motor	CO4	L2
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
13	Parallel Operation of dc motors	CO3	L2
14	Load sharing in case of similar and dissimilar dc motors	CO3	L2
15	Testing of dc motors	CO3	L3
16	Tap changing dc motors	CO3	L3
17	equivalent circuit	CO3	L2
18	no load and on load tap changing dc motors	CO4	L2
19	Necessity of Parallel operation	CO4	L2
18	conditions for parallel operation		
19	Single phase and three phaseinductionmotors		
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Used in distribution system	CO3	L3
2	Used in industrial application for sharing	CO4	L2
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
14	Write a brief note on parallel operation of two-single phase dc motors with unequal voltage ratio. Derive the necessary relation.	CO3	L2
15	List the advantages and disadvantages of an autodc motor	CO3	L2
16	Two 250KVA dc motors supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% & 0.9% and the reactance drops are 3.33% & 4% respectively. Calculate the KVA loading on each dc motor and its power factor when the total load on the dc motors is 500KVA & at 0.707 lagging p.f.	CO3	L2
17	What are the conditions to operate two dc motors in parallel?	CO4	L2

18	Derive an expression for the copper savings in an autodc motor as compared with 2 winding dc motor.	CO3	L2
19	A 400/100V, 10 KVA, 2 winding dc motor is to be employed as an autodc motor to supply a 400volts circuit from 500volts source. When tested as 2 winding dc motor at rated load of 0.85 p.f lagging, its efficiency is 97%. Determine its KVA rating and efficiency as an autodc motor	CO3	L2
20	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?	CO3	L2
21	Explain on load tap changing with neat diagram.		
e	**Experiences**	-	-
1		CO3	L2
2			
3			
4		CO4	L3
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	18EE44	Sem:	IV	Marks:	30	Time:	75 minutes		
Course:	MICROWAVES AND ANTENNAS								
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 1, 2**					**Marks**	**CO**	**Level**
1	a	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?					8	CO1	L1
	b	Explain on load tap changing with neat diagram.					6		L2
		Explain open-delta connection with the help of neat diagram. Show that open-delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection.					8	CO2	L3
		Write a brief note on parallel operation of two-single phase dc motors with unequal voltage ratio. Derive the necessary relation.					6		L2
1	a	List the advantages and disadvantages of an autodc motor					8		L4
	b	Two 250KVA dc motors supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% & 0.9% and the reactance drops are 3.33% & 4% respectively. Calculate the KVA loading on each dc motor and its power factor when the total load on the dc motors is 500KVA & at 0.707 lagging p.f.					4		L3
		What are the conditions to operate two dc motors in parallel?					4		L2
		Derive an expression for the copper savings in an autodc motor as compared with 2 winding dc motor.					8	CO3	L1
2	a	A 400/100V, 10 KVA, 2 winding dc motor is to be employed as an autodc motor to supply a 400volts circuit from 500volts source. When tested as 2 winding dc motor at rated load of 0.85 p.f lagging, its efficiency is 97%. Determine its KVA rating and efficiency as an autodc motor					6	CO4	L2
	b	Explain with neat sketch the construction of three phase core type and shell type dc motor.					8		L1
		With connection diagrams and equivalent circuits , Explain the theory behind the O.C and S.C tests conducted to find the constants of a dc motor.					8		L2
		A 50KVA, 4400/220V, dc motor has R_1=3.45Ω, R_2=0.009Ω, The Values of reactance's areX_1=5.2Ω,X_2=0.015Ω, calculate for the dc motor (i) Equivalent resistance as referred to primary ii) Equivalent resistance as referred to secondary iii) Equivalent reactance as referred to both primaryand secondary iv) Total copper loss, first using individual resistances of the windings and secondly, using equivalent resistances as referred to each					6		L2

		side v) Equivalent impedance referred to both sides			
2	a	Show the terminal connections of a three-phase dc motor with phasor diagram and corresponding clock method representation 1)Dd0 2) Yy6 3) Dy1 4) Yd11	8		L1
	b	Derive an expression for standing wave ratio and explain?	10	CO2	L3

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18EE44	Sem:	IV	Marks:	5	Time:	90 – 120 minutes
Course:	ELECTRIC MOTORS			Module : 1, 2			
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT17EE002	Write a brief note on parallel operation of two-single phase dc motors with unequal voltage ratio. Derive the necessary relation.	5	CO1	L2
2	1KT17EE004	List the advantages and disadvantages of an autodc motor	5	CO2	L3
3	1KT17EE005	Two 250KVA dc motors supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% & 0.9% and the reactance drops are 3.33% & 4% respectively. Calculate the KVA loading on each dc motor and its power factor when the total load on the dc motors is 500KVA & at 0.707 lagging p.f.		CO2	L4
4	1KT17EE006	What are the conditions to operate two dc motors in parallel?	5	CO1	L3
5	1KT17EE007	Derive an expression for the copper savings in an autodc motor as compared with 2 winding dc motor.		CO1	L2
6	1KT17EE008	A 400/100V, 10 KVA, 2 winding dc motor is to be employed as an autodc motor to supply a 400volts circuit from 500volts source. When tested as 2 winding dc motor at rated load of 0.85 p.f lagging, its efficiency is 97%. Determine its KVA rating and efficiency as an autodc motor		CO2	L3
7	1KT17EE009	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?		CO2	L4
8	1KT17EE0010	Explain on load tap changing with neat diagram.		CO1	L3
9	1KT17EE011	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?		CO1	L2
10	1KT17EE012	Explain with neat sketch the construction of three phase core type and shell type dc motor.		CO2	L3
11	1KT17EE013	Derive an equation for a single phase dc motor.		CO2	L4
12	1KT18EE400	Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load		CO1	L3
13	1KT17EE401	Explain open-delta connection with the help of neat diagram. Show that open-delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection.		CO1	L2
14	1KT17EE002	Show the terminal connections of a three-phase dc motor with phasor diagram and corresponding clock method representation 1)Dd0 2) Yy6 3) Dy1 4) Yd11		CO2	L3
15	1KT17EE003	A 50KVA, 4400/220V, dc motor has R_1=3.45Ω,R_2=0.009Ω, The Values of reactance's areX_1=5.2Ω,X_2=0.015Ω, calculate for the dc motor (i) Equivalent resistance as referred to primary ii)Equivalent resistance as referred to secondary iii) Equivalent reactance as referred to both primaryand secondary iv) Total copper loss, first using individual resistances of the windings and secondly, using equivalent resistances as referred to each side v) Equivalent impedance referred to both sides.		CO2	L4
16	1KT17EE004	A 25KVA single phase dc motor has 250 turns on the primary		CO1	L3

		and 40 turns on the secondary winding. The primary is connected to 1500V, 50Hz .Calculate i) Primary and secondary currents on full load ii) Secondary EMF iii) Maximum flux in the core			
17	1KT17EE005	Derive an equation for a single phase dc motor .Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load.		CO2	L4
18	1KT17EE006	A 25KVA single phase dc motor has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50Hz .Calculate i) Primary and secondary currents on full load ii) Secondary EMF iii) Maximum flux in the core		CO1	L3
19	1KT17EE002	Write a brief note on parallel operation of two-single phase dc motors with unequal voltage ratio. Derive the necessary relation.	5	CO1	L2
20	1KT17EE004	List the advantages and disadvantages of an autodc motor	5	CO2	L3
21	1KT17EE005	Two 250KVA dc motors supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% & 0.9% and the reactance drops are 3.33% & 4% respectively. Calculate the KVA loading on each dc motor and its power factor when the total load on the dc motors is 500KVA & at 0.707 lagging p.f.		CO2	L4
22	1KT17EE006	What are the conditions to operate two dc motors in parallel?	5	CO1	L3
23	1KT17EE007	Derive an expression for the copper savings in an autodc motor as compared with 2 winding dc motor.		CO1	L2
24	1KT17EE008	A 400/100V, 10 KVA, 2 winding dc motor is to be employed as an autodc motor to supply a 400volts circuit from 500volts source. When tested as 2 winding dc motor at rated load of 0.85 p.f lagging, its efficiency is 97%. Determine its KVA rating and efficiency as an autodc motor		CO2	L3
25	1KT17EE009	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?		CO2	L4
26	1KT17EE0010	Explain on load tap changing with neat diagram.		CO1	L3
27	1KT17EE011	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?		CO1	L2
28	1KT17EE012	Explain with neat sketch the construction of three phase core type and shell type dc motor.		CO2	L3
29	1KT17EE013	Derive an equation for a single phase dc motor.		CO2	L4
30	1KT18EE400	Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load		CO1	L3
31	1KT17EE401	Explain open-delta connection with the help of neat diagram. Show that open-delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection.		CO1	L2
32	1KT17EE002	Show the terminal connections of a three-phase dc motor with phasor diagram and corresponding clock method representation 1)Dd0 2) Yy6 3) Dy1 4) Yd11		CO2	L3
33	1KT17EE003	A 50KVA, 4400/220V, dc motor has R_1=3.45Ω,R_2=0.009Ω, The Values of reactance's areX_1=5.2Ω,X_2=0.015Ω, calculate for the dc motor (i) Equivalent resistance as referred to primary ii)Equivalent resistance as referred to secondary iii) Equivalent reactance as referred to both primaryand secondary iv) Total copper loss, first using individual resistances of the windings and secondly, using equivalent resistances as referred to each side v) Equivalent impedance referred to both sides.		CO2	L4
34	1KT17EE004	A 25KVA single phase dc motor has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50Hz .Calculate i) Primary and secondary currents on full load ii) Secondary EMF iii) Maximum flux in the core		CO1	L3

35	1KT17EE005	Derive an equation for a single phase dc motor .Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load.		CO2	L4
36	1KT17EE006	A 25KVA single phase dc motor has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500V, 50Hz .Calculate i) Primary and secondary currents on full load ii) Secondary EMF iii) Maximum flux in the core		CO1	L3

D2. TEACHING PLAN - 2

Module – 3

Title:	Striplines And Antenna Basics	Appr Time:	12 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Test on dc motors and connections	CO5	L2
2	Conversion of 3phase to 2 phase	CO6	L3
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
20	Tertiary winding dc motors	CO5	L3
21	Necessity of tertiary winding	CO5	L3
22	equivalent circuit and voltage regulation,	CO5	L3
23	tertiary winding in star/star dc motors	CO6	L2
24	rating of tertiary winding. Direct current motor	CO6	L2
25	Armature reaction	CO6	L2
26	Commutationand associated problems	CO6	L2
27	Synchronous motors: Armature windings, winding factors	CO6	L2
28	e.m.f equation	CO6	L2
29	Harmonics – causes	CO6	L3
30	reduction and elimination	CO6	L3
31	Synchronous reactance	CO6	L3
32	Armature reaction		
33	Equivalent circuit	**-**	**-**
c	Students should be able employ / apply the Module learnings to . . .	-	-
1	Used in industrial applications	CO5	L2
2	Used in Generating,transmission and distribution	CO6	L3
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
18	What is voltage regulation of a 3 phase synchronous motor? Describe the synchronous impedance method to determine regulation of an alternator for lagging and leading power factor	CO1	L1
19	Draw and explain equivalent circuit of tertiary dc motor.	CO1	L3
20	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?	CO2	L2
21	Explain current inrush phenomenon in dc motor.	CO2	L2
22	Derive an equation for the emf induced in an alternator.	CO2	L2
23	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.	CO2	L2
24	What are the sources of noise in dc motor? How to reduce the noise problem in dc motor?	CO2	L2
25	Derive the necessary expression for cross magnetizing effect and de-magnetizing effect.	CO2	L2
26	An 8 pole wave wound dc motor has 840 armature conductors. The armature current is 200A. find the armature reaction demagnetizing and cross	CO2	L2

	magnetizing ampere turns per pole if i) brushes are on G.N.A and ii) brushes are shifted 6° electrical from G.N.A		
27	With neat diagram explain the process of commutation in DC machines.	CO2	L2
28	Draw and explain the characteristics of DC series motor.	CO2	L2
29	State the possible causes of failure of excitation of self excited motor.	CO2	L2
30	What is voltage regulation of a 3 phase synchronous motor? Describe the synchronous impedance method to determine regulation of an alternator for lagging and leading power factor	CO2	L2
31	Draw and explain equivalent circuit of tertiary dc motor.	CO2	L2
e	**Experiences**	-	-
1		CO6	L2
2			
3			
4		CO6	L3
5			

Module – 4

Title:	Antenna Point sources and Arrays And Electric DIpoles	Appr Time:	13 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Voltage regulation of alternator	CO7	L3
2	Understand different test of dc motor	CO8	L4
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
32	motor load characteristic	CO7	L3
33	Voltage regulation	CO7	L3
34	excitation control for constant terminal voltage	CO7	L3
35	motor input and output	CO7	L3
36	Performance Analysis	CO7	L3
37	Parallel operation of motors and load sharing	CO7	L3
38	Synchronous motor on infinite bus-bars – General load diagram Electrical load diagram and V – curves	CO7	L3
39	Power angle characteristic and synchronizing power	CO7	L3
40	Effects of saliency	CO7	L3
41	two-reaction theory	CO8	L4
42	Direct and Quadrature reactance	CO8	L4
43	power angle diagram	CO8	L4
44	reluctance power	CO8	L4
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Used in distribution system	CO7	L3
2	Used in industrial application for sharing	CO8	L4
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
32	Explain Parallel operation of motors and load sharing	CO7	L3
33	Draw Power angle characteristic of motor and explain	CO7	L3
34	Write short note on Voltage regulation of motor	CO7	L3
35	With a phasor diagram explain the concept the two reaction theory in a salient pole machine	CO7	L3
36	Write short note on V-curves of synchronous motor	CO7	L3
37	With a neat diagram, Explain the slip lest on salient pole synchronous machine	CO7	L3

38	What is synchronization of alternator	CO8	L4
39	What are the conditions for proper synchronization of alternator	CO8	L4
40	Explain Parallel operation of motors and load sharing	CO8	L4
41	Draw Power angle characteristic of motor and explain	CO8	L4
e	**Experiences**	-	-
1		CO7	L2
2			
3			
4		CO8	L3
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	18EE44	Sem:	IV	Marks:	30	Time:	75 minutes		
Course:	ELECTRIC MOTORS								
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 3, 4**					**Marks**	**CO**	**Level**
1	a	What is voltage regulation of a 3 phase synchronous motor? Describe the synchronous impedance method to determine regulation of an alternator for lagging and leading power factor					20	CO5	L1
	b	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.							L2
	c	An 8 pole wave wound dc motor has 840 armature conductors. The armature current is 200A. find the armature reaction demagnetizing and cross magnetizing ampere turns per pole if i) brushes are on G.N.A and ii) brushes are shifted 6° electrical from G.N.A						CO6	L3
	d	Derive an equation for the emf induced in an alternator.							L1
1	a	Draw and explain equivalent circuit of tertiary dc motor.					20	CO7	L2
	b	Derive the necessary expression for cross magnetizing effect and de-magnetizing effect.							L4
	c	With a phasor diagram explain the concept the two reaction theory in a salient pole machine							L3
	d	Explain Parallel operation of motors and load sharing							L2
2	a	What is synchronization of alternator					20	CO8	L1
	b	What are the conditions for proper synchronization of alternator						CO8	L2
	c	What are the sources of noise in dc motor? How to reduce the noise problem in dc motor?							L1
	d	Derive the necessary expression for cross magnetizing effect and de-magnetizing effect.							L2
2	a	What are the conditions for proper synchronization of alternator					20		L2
	b	With neat diagram explain the process of commutation in DC machines.							L2
	c	Draw and explain the characteristics of DC series motor.							L1
	d	State the possible causes of failure of excitation of self excited motor.							L3

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18EE44	Sem:	IV	Marks:	5	Time:	90 – 120 minutes
Course:	MICROWAVES AND ANTENNAS				Module : 3, 4		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT17EE002	What is voltage regulation of a 3 phase synchronous motor? Describe the synchronous impedance method to determine	5	CO8	L2

		regulation of an alternator for lagging and leading power factor			
2	1KT17EE004	Draw and explain equivalent circuit of tertiary dc motor.	5	CO7	L3
3	1KT17EE005	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?		CO8	L4
4	1KT17EE006	Explain current inrush phenomenon in dc motor.	5	CO7	L3
5	1KT17EE007	Derive an equation for the emf induced in an alternator.	5	CO8	L2
6	1KT17EE008	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.	5	CO7	L3
7	1KT17EE009	What are the sources of noise in dc motor? How to reduce the noise problem in dc motor?		CO8	L4
8	1KT17EE0010	Derive the necessary expression for cross magnetizing effect and de-magnetizing effect.	5	CO7	L3
9	1KT17EE011	An 8 pole wave wound dc motor has 840 armature conductors. The armature current is 200A. find the armature reaction demagnetizing and cross magnetizing ampere turns per pole if i) brushes are on G.N.A and ii) brushes are shifted 6° electrical from G.N.A	5	CO8	L2
10	1KT17EE012	With neat diagram explain the process of commutation in DC machines.	5	CO7	L3
11	1KT17EE013	Draw and explain the characteristics of DC series motor.		CO8	L4
12	1KT18EE400	Explain Parallel operation of motors and load sharing	5	CO7	L3
13	1KT17EE401	Draw Power angle characteristic of motor and explain	5	CO8	L2
14	1KT17EE002	Write short note on Voltage regulation of motor	5	CO7	L3
15	1KT17EE003	With a phasor diagram explain the concept the two reaction theory in a salient pole machine		CO8	L4
16	1KT17EE004	Write short note on V-curves of synchronous motor	5	CO7	L3
17	1KT17EE005	With a neat diagram, Explain the slip lest on salient pole synchronous machine	5	CO8	L2
18	1KT17EE006	What is synchronization of alternator	5	CO7	L3
19	1KT17EE007	What are the conditions for proper synchronization of alternator		CO8	L4

D3. TEACHING PLAN - 3

Module – 5

Title:	Loop and Horn Antenna and Antenna Types	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	The operation and characteristics of motor	CO9	L2
2	Understand different test conducted on synchronous motor	CO10	L2
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
45	Open circuit and short circuit characteristics	CO9	L2
46	Assessment of reactance- short circuit ratio	CO9	L2
47	synchronous reactance	CO9	L2
48	adjusted synchronous reactance and Potier reactance	CO9	L2
49	Voltage regulation by EMF	CO9	L2

50	MMF, ZPF methods	CO10	L2
51	Performance of synchronous motors	CO10	L2
52	Capability curve for large turbo motors and salient pole motors	CO10	L2
53	Starting	CO10	L2
54	synchronizing and control	CO10	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Used in generating station	CO9	L2
2	Used in industries	CO10	L2
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
42	Wright short note on capability of synchronous motor	CO9	L2
43	What is hunting in synchronous motor	CO9	L2
44	Explain role of damping winding	CO9	L2
45	With neat sketch explain OCC and SCC characteristics of synchronous motor	CO9	L2
46	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance	CO9	L2
47	List the advantages and disadvantages of synchronous impedance of computing the regulation	CO9	L2
48	Define short circuit ratio	CO9	L2
49	What is the relation between short circuit ratio and synchronous reactance	CO9	L2
50	Name the various method for determining of voltage regulation for 3 phase alternator and describe any one method in detail	CO9	L2
51	A 2300V,50Hz 3 phase star connected alternator has an effective armature resistance 0.2ohm a field current of 35A is produced a current of 150A on short circuit and open circuit emf 780V(line) calculate the voltage regulation of 0.8 pf lagging for the full load current of 25A	CO9	L2
52	Wright short note on capability of synchronous motor	CO10	L2
53	What is hunting in synchronous motor	CO10	L2
54	Explain role of damping winding	CO10	L2
55	With neat sketch explain OCC and SCC characteristics of synchronous motor	CO10	L2
56	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance	CO10	L2
57	List the advantages and disadvantages of synchronous impedance of computing the regulation	CO10	L2
58	Define short circuit ratio	CO10	L2
59	What is the relation between short circuit ratio and synchronous reactance	CO10	L2
60	Name the various method for determining of voltage regulation for 3 phase alternator and describe any one method in detail	CO10	L2
e	**Experiences**	-	-
1		CO10	L2
2		CO9	
3			
4		CO9	L3
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	18EE44	Sem:	IV	Marks:	30	Time:	75 minutes		
Course:	ELECTRIC MOTORS								
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 5**					**Marks**	**CO**	**Level**
1	a	Wright short note on capability of synchronous motor					5	CO9	L2
	b	What is hunting in synchronous motor					5	CO9	L2

	c	Explain role of damping winding	5	CO9	L2
		With neat sketch explain OCC and SCC characteristics of synchronous motor			
		Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance			
1	a	List the advantages and disadvantages of synchronous impedance of computing the regulation	5	CO9	L2
	b	Define short circuit ratio	5	CO9	L2
	c	What is the relation between short circuit ratio and synchronous reactance	5	CO9	L2
		Name the various method for determining of voltage regulation for 3 phase alternator and describe any one method in detail			
		A 2300V,50Hz 3 phase star connected alternator has an effective armature resistance 0.2ohm a field current of 35A is produced a current of 150A on short circuit and open circuit emf 780V(line) calculate the voltage regulation of 0.8 pf lagging for the full load current of 25A			
2	a	Draw and explain the characteristics of DC series motor.	5	CO10	L2
	b	Explain Parallel operation of motors and load sharing	5	CO10	L2
	c	Draw Power angle characteristic of motor and explain	5	CO10	L2
		Write short note on Voltage regulation of motor			
		With a phasor diagram explain the concept the two reaction theory in a salient pole machine			
2	a	Write short note on V-curves of synchronous motor	5	CO10	L2
	b	With a neat diagram, Explain the slip lest on salient pole synchronous machine	5	CO10	L2
	c	What is synchronization of alternator	5	CO10	L2
		What are the conditions for proper synchronization of alternator			

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions

Crs Code:	18EE44	Sem:	IV	Marks:	5	Time:	90 – 120 minutes
Course:	ELECTRIC MOTORS				Module : 5		

Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.

SNo	USN	Assignment Description	Marks	CO	Level
1	1KT17EE002	Draw and explain the characteristics of DC series motor.	5	CO10	L2
2	1KT17EE004	Explain Parallel operation of motors and load sharing	5	CO10	L2
3	1KT17EE005	Draw Power angle characteristic of motor and explain	5	CO9	L2
4	1KT17EE006	Write short note on Voltage regulation of motor	5	CO9	L2
5	1KT17EE007	With a phasor diagram explain the concept the two reaction theory in a salient pole machine	5	CO9	L2
6	1KT17EE008	Write short note on V-curves of synchronous motor	5	CO9	L2
7	1KT17EE009	With a neat diagram, Explain the slip lest on salient pole synchronous machine	5	CO9	L2
8	1KT17EE0010	What is synchronization of alternator	5	CO9	L2
9	1KT17EE011	What are the conditions for proper synchronization of alternator	5	CO9	L2
10	1KT17EE012	Wright short note on capability of synchronous motor	5	CO9	L2
11	1KT17EE013	What is hunting in synchronous motor	5	CO9	L2
12	1KT18EE400	Explain role of damping winding	5	CO9	L2
13	1KT17EE401	With neat sketch explain OCC and SCC characteristics of synchronous motor	5	CO10	L2
14	1KT17EE002	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance	5	CO10	L2
15	1KT17EE003	List the advantages and disadvantages of synchronous impedance of computing the regulation	5	CO10	L2
16	1KT17EE004	Define short circuit ratio	5	CO10	L2

17	1KT17EE005	What is the relation between short circuit ratio and synchronous reactance	5	CO10	L2
18	1KT17EE006	Name the various method for determining of voltage regulation for 3 phase alternator and describe any one method in detail	5	CO10	L2
19	1KT17EE002	A 2300V,50Hz 3 phase star connected alternator has an effective armature resistance 0.2ohm a field current of 35A is produced a current of 150A on short circuit and open circuit emf 780V(line) calculate the voltage regulation of 0.8 pf lagging for the full load current of 25A	5	CO10	L2
20	1KT17EE004	Wright short note on capability of synchronous motor	5	CO10	L2
21	1KT17EE005	What is hunting in synchronous motor	5	CO10	L2
22	1KT17EE006	Explain role of damping winding	5	CO10	L2
23	1KT17EE007	With neat sketch explain OCC and SCC characteristics of synchronous motor	5	CO10	L2
24	1KT17EE008	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance	5	CO9	L2
25	1KT17EE009	List the advantages and disadvantages of synchronous impedance of computing the regulation	5	CO9	L2
26	1KT17EE0010	Define short circuit ratio	5	CO9	L2
27	1KT17EE011	What is the relation between short circuit ratio and synchronous reactance	5	CO9	L2
28	1KT17EE012	Name the various method for determining of voltage regulation for 3 phase alternator and describe any one method in detail	5	CO9	L2
29	1KT17EE013	A 2300V,50Hz 3 phase star connected alternator has an effective armature resistance 0.2ohm a field current of 35A is produced a current of 150A on short circuit and open circuit emf 780V(line) calculate the voltage regulation of 0.8 pf lagging for the full load current of 25A	5	CO9	L2
30	1KT18EE400	Wright short note on capability of synchronous motor	5	CO9	L2
31	1KT17EE401	What is hunting in synchronous motor	5	CO9	L2
32	1KT17EE002	Draw and explain the characteristics of DC series motor.	5	CO9	L2
33	1KT17EE004	Explain Parallel operation of motors and load sharing	5	CO9	L2
34	1KT17EE005	Draw Power angle characteristic of motor and explain	5	CO10	L2
35	1KT17EE006	Write short note on Voltage regulation of motor	5	CO10	L2
36	1KT17EE007	With a phasor diagram explain the concept the two reaction theory in a salient pole machine	5	CO10	L2
37	1KT17EE008	Write short note on V-curves of synchronous motor	5	CO10	L2
38	1KT17EE009	With a neat diagram, Explain the slip lest on salient pole synchronous machine	5	CO10	L2
39	1KT17EE0010	What is synchronization of alternator	5	CO10	L2
40	1KT17EE011	What are the conditions for proper synchronization of alternator	5	CO10	L2
41	1KT17EE012	Wright short note on capability of synchronous motor	5	CO10	L2
42	1KT17EE013	What is hunting in synchronous motor	5	CO10	L2
43	1KT18EE400	Explain role of damping winding	5	CO10	L2
44	1KT17EE401	With neat sketch explain OCC and SCC characteristics of synchronous motor	5	CO10	L2
45	1KT17EE002	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance	5	CO9	L2
46	1KT17EE003	List the advantages and disadvantages of synchronous impedance of computing the regulation	5	CO9	L2
47	1KT17EE004	Define short circuit ratio	5	CO9	L2
48	1KT17EE005	What is the relation between short circuit ratio and synchronous reactance	5	CO9	L2
49	1KT17EE006	Name the various method for determining of voltage regulation for 3 phase alternator and describe any one	5	CO9	L2

		method in detail			

F. EXAM PREPARATION

1. University Model Question Paper

Course:		ELECTRIC MOTORS						Month / Year		May /2018	
Crs Code:		18EE44	Sem:	IV	Marks:	80		Time:		180 minutes	
Module	**Note**	Answer all FIVE full questions. All questions carry equal marks.							**Marks**	**CO**	**Level**
1	a	Derive an equation for a single phase dc motor.							16 / 20	CO1	
	b	Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load									
	c	Explain open-delta connection with the help of neat diagram. Show that open-delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection.								CO2	
	d	Show the terminal connections of a three-phase dc motor with phasor diagram and corresponding clock method representation 1)Dd0 2) Yy6 3) Dy1 4) Yd11									
		OR									
1	a	What are the conditions to operate two dc motors in parallel?							16 / 20	CO1	
	b	Derive an expression for the copper savings in an autodc motor as compared with 2 winding dc motor.								CO2	
	c	A 400/100V, 10 KVA, 2 winding dc motor is to be employed as an autodc motor to supply a 400volts circuit from 500volts source. When tested as 2 winding dc motor at rated load of 0.85 p.f lagging, its efficiency is 97%. Determine its KVA rating and efficiency as an autodc motor									
	d	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?									
2	a	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?							16 / 20	CO3	
	b	Explain current inrush phenomenon in dc motor.									
	c	Derive an equation for the emf induced in an alternator.								CO4	
	d	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.									
		OR									
2	a	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?							16 / 20	CO3	
	b	Explain with neat sketch the construction of three phase core type and shell type dc motor.								CO4	
	c	Derive an equation for a single phase dc motor.									
	d	Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load									
3	a	Write a brief note on parallel operation of two-single phase dc motors with unequal voltage ratio. Derive the necessary relation.							16 / 20	CO5	
	b	List the advantages and disadvantages of an autodc motor									
	c	Two 250KVA dc motors supplying a network are connected in parallel on both primary and secondary sides. Their voltage ratios are the same. The resistance drops are 1.5% & 0.9% and the reactance drops are 3.33% & 4% respectively. Calculate the KVA loading on each dc motor and its power factor when the total load on the dc motors is 500KVA & at 0.707 lagging p.f.								CO6	
	d	What are the conditions to operate two dc motors in parallel?									
		Derive an expression for the copper savings in an autodc motor as compared with 2 winding dc motor.									

3	a	A 400/100V, 10 KVA, 2 winding dc motor is to be employed as an autodc motor to supply a 400volts circuit from 500volts source. When tested as 2 winding dc motor at rated load of 0.85 p.f lagging, its efficiency is 97%. Determine its KVA rating and efficiency as an autodc motor	16 / 20	CO5	
	b	Derive an equation for the emf induced in an alternator.			
	c	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.		CO6	
	d				
		Draw and explain the characteristics of DC series motor.			
4	a	Explain Parallel operation of motors and load sharing	16 / 20	CO7	
	b	Draw Power angle characteristic of motor and explain			
	c	Write short note on Voltage regulation of motor		CO8	
	d	**OR**			
		Wright short note on capability of synchronous motor			
4	a	What is hunting in synchronous motor	16 / 20	CO7	
	b	Explain role of damping winding		CO8	
	c	With neat sketch explain OCC and SCC characteristics of synchronous motor			
	d	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance			
		List the advantages and disadvantages of synchronous impedance of computing the regulation			
5	a	Define short circuit ratio	16 / 20	CO9	
	b	What is the relation between short circuit ratio and synchronous reactance		CO10	
	c	Explain role of damping winding			
	d	**OR**			
		Define short circuit ratio			
5	a	What is the relation between short circuit ratio and synchronous reactance	16 / 20	CO9	
	b	Name the various method for determining of voltage regulation for 3 phase alternator and describe any one method in detail			
	c	A 2300V,50Hz 3 phase star connected alternator has an effective armature resistance 0.2ohm a field current of 35A is produced a current of 150A on short circuit and open circuit emf 780V(line) calculate the voltage regulation of 0.8 pf lagging for the full load current of 25A		CO10	
	d	Analyze precisely the computing time and space requirements of this new version of Prim's algorithm using adjacency lists.			

2. SEE Important Questions

Course:		ELECTRIC MOTORS						Month / Year	May /2018	
Crs Code:		18EE44	Sem:	7	Marks:	80		Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.						-	-	
Module	Qno.	Important Question						**Marks**	**CO**	**Year**
1	a	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?						10	CO1	2004
	b	Explain with neat sketch the construction of three phase core type and shell type dc motor.						10	CO2	2013
	c	Derive an equation for a single phase dc motor.						10	CO2	2013
	d	Draw and explain vector diagram of dc motor loaded with Inductive and capacitive load						10	CO2	2013

	e	Explain open-delta connection with the help of neat diagram. Show that open-delta connection has a KVA rating of 58% of the rating of the normal delta-delta connection.	10	CO2	2012
		Show the terminal connections of a three-phase dc motor with phasor diagram and corresponding clock method representation 1)Dd0 2) Yy6 3) Dy1 4) Yd11			
2	a	Draw and explain equivalent circuit of tertiary dc motor.	10	CO3	2012
	b	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?	8	CO3	2010
	c	Explain current inrush phenomenon in dc motor.	8	CO3	2010
	d	Derive an equation for the emf induced in an alternator.	10	CO4	2012
	e	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.	10	CO4	2012
3	a	Draw and explain equivalent circuit of tertiary dc motor.	8	CO5	2012
	b	Explain the reason for tap changing in dc motor. State on which winding the taps are provided & why?	8	CO5	2012
	c	Explain current inrush phenomenon in dc motor.	8	CO5	2013
	d	Derive an equation for the emf induced in an alternator.	9	CO6	2010
	e	What is armature reaction? With neat figure explain armature reaction in DC machines under normal working condition.	9	CO6	2014
		What are the sources of noise in dc motor? How to reduce the noise problem in dc motor?			
4	a	Explain Parallel operation of motors and load sharing	10	CO7	2009
	b	Draw Power angle characteristic of motor and explain	10	CO7	2009
	c	Write short note on Voltage regulation of motor	10	CO7	2011
	d	With a phasor diagram explain the concept the two reaction theory in a salient pole machine	10	CO8	2009
	e	Write short note on V-curves of synchronous motor	14	CO8	2009
5	a	Wright short note on capability of synchronous motor	10	CO9	2011
	b	What is hunting in synchronous motor	10	CO9	2011
	c	Explain role of damping winding	10	CO9	2010
	d	With neat sketch explain OCC and SCC characteristics of synchronous motor	12	CO10	2012
	e	Differentiate between synchronous reactance, adjusted synchronous reactance and Potier reactance	12	CO10	2009
		List the advantages and disadvantages of synchronous impedance of computing the regulation			
		Define short circuit ratio			
		What is the relation between short circuit ratio and synchronous reactance			

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Module-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	DC Motors: Classification, Back emf, Torque equation, and significance of back emf, Characteristics of shunt, series & compound motors. Speed control	3	- L1 - L2	L2	- -	- Lecture - -	- Slip Test - -

	of shunt, series and compound motors. Application of motors						
1	DC motor starters –3 point and 4 point Losses and efficiency-Losses in DC motors, power flow diagram,efficiency, condition for maximum efficiency	9	- L3 - L4	L4	- -	- Lecture - Tutorial -	- Assignment - -
2	Testing of dc motors: Direct & indirect methods of testing of DC motors-Brake test, Swinburne's test, Retardation test, Hopkinson's test, Field's test, merits and demerits of tests Three phase Induction motors: Review of concept and generation of rotating magnetic field, Principle of operation, construction	4	- L2 - L3	L3	- -	- Lecture -	- Assignment -
2	classification and types; squirrel-cage, slip-ring (No question shall be set from the review portion). Slip, Torque equation, torque-slipcharacteristic covering motoring, generating and braking regions of operation, Maximum torque, significance of slip	3	- L2 - L2	L2	- -	- Lecture -	- Slip Test -
3	Performance of three-phase Induction Motor: Phasor diagram of induction motor on no-load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the circle diagram and equivalent circuit.	5	- L1 - L3	L3	- -	- Lecture -	- Slip Test -
3	Cogging and crawling High torque rotors-double cage and deep rotor bars. Equivalent circuit and performance evaluation of double cage induction motor. Induction motor working as induction generator;standalone operation and grid connected operation.	12	- L3 - L2	L3	- -	- Lecture - Tutorial -	- Assignment - -
4	Starting and speed Control of Three-phase Induction Motors: Need for starter. Direct on line, Star-Delta and auto transformer starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods Single-phase Induction Motor:	8	- L3 - L1	L3	- -	- Lecture - Tutorial -	- Assignment - -
4	Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors.Comparison of single phase motors and applications	8	- L2 - L4	L4	- -	- Lecture - Tutorial -	- Assignment - -
5	Synchronous motor: Principle of	5	- L2	L2	-	- Lecture	-

	operation, phasor diagrams, torque and torque angle, Blondel diagram, effect of change in load, effect of change in excitation, V and inverted V curves		- L2		-	- -	Assignment - -
5	Synchronous con denser, hunting and damping. Methods of starting synchronous motors Other motors:Construction and operation of Universal motor, AC servomotor, Linear induction motor and stepper motors.	5	- L2 - L2	L2	- -	- Lecture - -	- Assignment - -

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Module- #	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. Ashort word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome **Student Should be able to ...**
A	I	J	K	L	M	N
1	Single phase D C Motors	Characteristi cs and operation	Characteristi cs and operation DC motor	Characteristics and operation DC motor	- Understand - DC motor - -	Understand the working of DC motor
1	Three-phase D C Motors	Winding connection	Starting of DC motors	Testing in DC motors	- Analyze - Transmission Lines - -	Analyze the Testing in DC motors.
2	Parallel Operation of D C Motors	Load sharing	Testing in DC motors	Working andCharacteristi cs of Induction motor	- Analyze - Induction motor - -	Analyze the Characteristics of Induction motor.
2	Autotransform er and Tap changing D C Motors	Copper saving in transformer	Working of Induction motor	Starting methods of induction motor	- Understand - Starting methods	Understand the working of differentStarting methods of induction motor.
3	Tertiary winding D C Motors	Working of Tertiary winding	Characteristi cs of Induction motor	Characteristics of Synchronous Motor	- Understand - Synchronous Motor - -	UnderstandSynchron ous Motor
3	Direct current Generator Synchronous motors	Characteristi cs of DC generator	Faults in induction motor	Characteristics and operation DC motor	- Understand - Characteristi cs -	Understand operation DC motor.

					-	
4	Synchronous motors	Operation of AC generator	Starting methods of induction motor	Testing in DC motors	- Understand - Testing	Understand the testing Induction motor.
4	Synchronous generator characteristics	Characteristics of AC generator	Types of single phase induction motor	Working andCharacteristics of Induction motor	- Analyze - single phase induction motor	Analyze the working of single phase induction motor.
5	Synchronous generator voltage regulation	Test on Synchronous generator	Characteristics of Synchronous Moto	Starting methods of induction motor	- Understand - Starting methods	Explain the working of Starting methods
5	Performance of Synchronous generator	Hunting in AC motors	characteristics of different motor	Characteristics of Synchronous Motor	- Understand - characteristics	Understand of characteristics of synchronous motor