Ref No:

## < Sri Krishna Institute of Technology, Bengaluru>



Academic Year 2019-2020

Program:	B E – Electrical & Electronics Engineering
Semester :	6
Course Code:	17EE651
Course Title:	Computer Aided Electrical Drawing
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	40
Course Plan Author:	AVINASH S

Academic Evaluation and Monitoring Cell

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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:	6	Academic Year:	2019-20
Course Title:	CAED	Course Code:	17EE651
Credit / L-T-P:	3 / 3-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	40 Hours	SEE Marks:	60 Marks
CIA Marks:	40 Marks	Assignment	1 / Module
Course Plan Author:	Avinash S	Sign	Dt:
Checked By:		Sign	Dt:
CO Targets	CIA Target : 100 %	SEE Target:	100 %

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

#### 2. Course Content

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

Mod	Content	Teachi	Identified Module	Blooms
ule		ng	Concepts	Learning
		Hours		Levels
1	Winding Diagrams: (a) Developed Winding Diagrams of D.C.	10	- DC Armature	Understand
	Machines: Simplex Double Layer Lap and Wave Windings. (b)		winding,	L2,
	Developed Winding Diagrams of A.C. Machines: (c)Integral		- AC Armature	Apply L3
	and Fractional Slot Double Layer Three Phase Lap and Wave		winding	
	Windings. (d) Single Layer Windings – Un-Bifurcated 2 and 3			
	Tier Windings, Mush Windings, Bifurcated 3 Tier Windings.			
2	Single Line Diagrams: Single Line Diagrams of Generating	10	- Generating	Understand
	Stations and Substations Covering Incoming Circuits,		stations &	L2,
	Outgoing Circuits, Busbar Arrangements (Single,		Substations.	Apply L3,
	Sectionalised Single, Main and Transfer, Double Bus Double			Analyze L4
	Breaker, Sectionalised Double Bus, One and a Half Circuit			
	Breaker Arrangement, Ring Main),Power Transformers,			
	Circuit Breakers, Isolators, Earthing Switches, Instrument			
	Transformers, Surge or Lightning Arresters, Communication			
	Devices (PowerLine Carrier) and Line Trap			
3	Electrical Machine Assembly Drawings Using Design Data,	10	- Types of single	Understand
	Sketches or Both: Transformers - Sectional Views Of Single		and I hree phase	L2,
	And Three Phase Core And Shell Type Transformers		transformers,	Apply L3,
			-Sectional Views,	Analyze L4
			-voltage levels.	
4	Electrical Machine Assembly Drawings Using Design Data,	10	- Interior	Understand
	Sketches or Both: D.C. Machine - Sectional Views of Yoke		construction,	L2,
	with Poles, Armature and Commutator dealt separately.		- Sketches &	Apply L3,
			Placements	Analyze L4
5	Electrical Machine Assembly Drawings Using Design Data,	10	- Interior	Understand
	Sketches or Both: Alternator – Sectional Views of Stator and		construction,	L2,
	Rotor dealt separately		- SKEICHES &	Apply L3,
	Tatal		Placements	Analyze L4
-	Iotal	50	-	-

#### 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.

<u>J. 1.05001011. 1.000</u>	ent developmentes en the concepts	publications in journals, contenences etc.
Modul	Details	Chapters Availability
17EE651 / A		Copyright ©2017. cAAS. All rights reserved.

es		in book	
Α	Text books (Title, Authors, Edition, Publisher, Year.)	-	-
1,2,3,4, 5	Computer Aided Electrical Drawing, M.Yogesh, B S Nagaraja, N Nandan, Ashoke K Ghosh, PHI learning Pyt Ltd, 2014		In Lib / in Dept
1,2,3,4,	Computer Aided Electrical Drawing, uLektz, uLektz Learning Solutions		Not Available
5	Private Limited.		
1,2,3,4, 5	CAD for Electrical Engineers, Dr.Indira, V D Sankarlal & D Beula, 2 <sup>nd</sup> , Sanguine Technical Publishers, 2015		n Lib / in Dept
1,2,3,4,	Computer Aided Electrical Drawing, Panel Of Experts		Not Available
В	Reference books (Title, Authors, Edition, Publisher, Year.)	-	-
1, 2	A course in Electrical Machine design, A. K. Sawhney, Dhanpat Rai 6th Edition, 2013		In Lib / in Dept
1, 2	Electrical Engineering Drawing K. L. Narang Satya Prakashan 2014		Not Available
	"Electrical Machine Design" , M.V. Deshpande, Third Edition, ,PHI Learning Pvt Ltd2009.		Not Available
С	Concept Videos or Simulation for Understanding	-	-
C1	Design of DC Winding		
	https://www.youtube.com/watch?v=moF2y87Gdlk		
	https://www.youtube.com/watch?v=EZjpNooSXIo		
	https://www.youtube.com/watch?v=X1TTGjNgyrg		
C1	Design of AC Winding		
	https://www.youtube.com/watch?v=PII4pz7ohpA		
	https://www.youtube.com/watch?v=00NC05QpDp0		
02	Sudy of Substation equipments		
C2	Sketch of Station Javouts		
	https://www.voutube.com/watch?v=huKkzrJPEU4		
C3	Design of Single phase Transformer		
	https://www.youtube.com/watch?v=XOgPqtLy1Sk		
	https://www.youtube.com/watch?v=X85MbtWodFQ		
C3	Design of Three phase Transformer		
	https://www.youtube.com/watch?v=nF9FF7220dM		
	https://www.youtube.com/watch?v=X85MbtWodFQ&t=23s		
C3	Study of Sectional views		
<u> </u>	nilps//www.youlube.com/watch?v=w1/CKm2D5Ao		
03	https://www.voutube.com/watch?v=ol-OoECDama		
	https://www.youtube.com/watch?v=hTifg4lt9zo		
	https://www.youtube.com/watch?v=rgPoaMth7LM		
C3	Study of Sectional views		
	https://www.youtube.com/watch?v=Wf7Ckmzb5A8		
C3	Design of Alternator		
	https://www.youtube.com/watch?v=tiKH48EMgKE		
D	Software Tools for Design	-	-
	AutoCAD		
E	Recent Developments for Research	-	-
F	Others (Web, Video, Simulation, Notes etc.)	_	-
1	https://www.youtube.com/watch?v=CSnTL9ndvis		
2	https://www.youtube.com/watch?v=wex3ZenASlo		
	https://docs.google.com/viewer?		
	a=v&pid=sites&srcid=Y21yaXQuYWMuaW58a2FzaGlmYWhtZWR8Z3g6N		
	2YwMjA5YzdmNzEzMGE5MQ		

### 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.

Mod	Course	Course Name		Topic /	Description		Sem	Rema	rks		Blooms
ules	Code										Level
3,4&	15EE15/2	Basic Electrical	DC m	achine,	Alternator	and	1 <sup>st</sup> /	A Seminar	on [	C	Understa
5	5	Engineering	Transfor	mer/	knowledge	of	2 <sup>nd</sup>	machine,			nd L2
			construc	ction				Transformer	a	٦d	
								Alternator			
3	15EE33	Transformers	Single	and	Three	phase	3 <sup>rd</sup>	A Seminar	on [	C	Understa
		and Generators	Transfor	mer /	Knowledg	ge on		machine,			nd L2
			Types of	f transfo	rmers			Transformer	a	٦d	
								Alternator			

Students must have learnt the following Courses / Topics with described Content ....

### 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.

Mod	Topic / Description	Area	Remarks	Blooms
ules				Level
1	AC & DC Windings / Knowledge on	Placements	A seminar on Winding	Apply
	Armature winding	&	terminologies	L3
		Gate		
2	Substation / Knowledge on Different	Placements	A seminar on substations	Analyze
	sub-stations and their operations			L4
3	Transformers / Knowledge on design of	Placements	A seminar on Transformers	Analyze
	Transformers and their specifications	&		L4
	and voltage levels and insulation	Gate		
4	DC machines / Knowledge on design of	Placements	A seminar on DC machines	Analyze
	DC machine and their specifications	&		L4
		Gate		
5	Alternators / Knowledge on design of	Placements	A seminar on Alternators	Analyze
	Alternators and their specifications	&		L4
		Gate		

### 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.

Mod	Course	Course Outcome	Teach.	Concept	Instr	Assessme	Blooms'
ules	Code.#	At the end of the course, student	Hours		Method	nt	Level
		should be able to				Method	
1	17EE651.1	Interpret the notations and formulas required and design the winding diagrams of AC and DC machines.	5	DC Winding	Lecture /PPT	Assignme nt & Unit Test	Apply L3
1	17EE651.1	Interpret the notations and formulas required and design the winding diagrams of AC and DC machines.	5	AC Winding	Lecture /PPT/ Hands On	Assignme nt & Unit Test	Apply L3
2	17EE651.2	Develop a layout for substation using the standard symbols for	4	Substation equipment	Lecture /PPT/	Assignme nt &	Analyze L4

		substation equipment		S	Hands On	Unit Test	
2	17EE651.2	Develop a layout for substation using the standard symbols for substation equipment	6	Station layouts	Lecture / PPT/Ha nds On	Assignme nt & Unit Test	Analyze L4
3	17EE651.3	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	5	Single phase Transform er	Lecture / PPT/Ha nds On	Assignme nt & Unit Test	Analyze L4
3	17EE651.3	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	5	Three phase Transform er	Lecture / PPT/Ha nds On	Assignme nt & Unit Test	Analyze L4
4	17EE651.3	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	4	Sectional views	Lecture / PPT	Assignme nt & Unit Test	Apply L3
4	17EE651.3	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	6	DC machine	Lecture / PPT/Ha nds On	Assignme nt & Unit Test	Analyze L4
5	17EE651.3	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	4	Sectional views	Lecture / PPT	Assignme nt & Unit Test	Apply L3
5	17EE651.13	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	6	Alternator	Lecture / PPT/Ha nds On	Assignme nt & Unit Test	Analyze L4
-	-	Total	50	-	-	-	L3-L4

## 2. Course Applications

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

Mod	Application Area	CO	Level				
ules	Compiled from Module Applications.						
1	Winding diagrams are used to design DC armature and field windings, where good	CO1	L4				
	speed regulation is needed with varying loads, such as grinding machines and						
	lathes.						
1	In automotive, hoists, lifts and cranes as it has a high starting torque.	CO1	L4				
	They are mainly used for heavy industrial applications and for machine tools.						
	In automotive applications for electric and hybrid electric vehicles.						
2	Used for protection against abnormal conditions and helps for Transmission and	CO2	L3				
	Distribution purpose.						
2	Single line diagrams are useful in planning a substation layout.	CO2	L3				
	It serves as protection hub of the transmission system.						
	It assists in determining energy transfer with help of transmission lines.						

3	The main application of Transformer is to Step up (Increase) or Step down (Decrease) the level of Voltage in substations and industries. They operate as a step-down voltage transformer and decrease the home voltage value to the value suitable for electronics supplying.	CO3	L4
3	Three Phase transformers are widely used as Power transformers, Distribution transformers and in Electrical Grids	CO3	L4
4	Used to show interior detail that is too complicated to be shown clearly and dimensioned by the traditional orthographic views and hidden lines.	CO3	L3
4	Used in Traction system, Cranes, air compressors, Vaccum Cleaner, Sewing machine, Lathe Machines, Centrifugal Pumps, Fans, Blowers, Conveyors, Lifts, Weaving Machine, Spinning machines. Used as a supply source of DC motors and to charge the battery and Providing excitation to the alternators	CO3	L4
5	Used to show interior detail that is too complicated to be shown clearly and dimensioned by the traditional orthographic views and hidden lines.	CO3	L3
5	One of the most important application of synchronous machines is to generate electric power at power station. Synchronous motors are also used in paper mills, refineries and numerous other applications	CO3	L4

### 3. Articulation Matrix

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

-	-	Course Outcomes		Program Outcomes					-									
Mod	CO.#	At the end of the course	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS	Lev
ules		student should be able to	1	2	3	4	5	6	7	8	9	10	11	12	O1	02	03	el
1	17EE651.1	Interpret the notations and	3	2	3	-	3	-	-	-	-	-	-	-	2	3	-	L3
		formulas required and design																
		the winding diagrams of AC and																
		DC machines.																
1	17EE651.2	Develop a layout for substation	3	3	3	-	3	-	-	-	-	-	-	-	2	3	2	L4
		using the standard symbols for																
		substation equipment																
2	17EE651.3	Talk about and development of	3	3	3	-	3	-	-	-	-	-	-	-	2	3	-	L4
		DC machines Alternators and its																
		parts using the design data																
		sketches																
-	EE651PC	Average attainment (1, 2, or 3)																-
-	PO, PSO	1.Engineering Knowledge; 2.Prob	lem	A	naly	sis;	3.1	Des	ign	/	De	velc	pm	ient	of	Sc	olut	ions;
		4.Conduct Investigations of Comp	lex i	Prol	oler	ns;	5.M	ode	ern i	Тоо	l Us	sag	e; 6	The	e Er	ngin	eer	and
		Society; 7.Environment and S	usto	aina	bilit	ty;	8.E	thic	S;	9.lr	ndiv	vidu	al	an	d	Тес	imv	vork;
		10.Communication; 11.Project N	Man	age	eme	ent	ar	nd	Fir	nano	ce;	12	.Lif	e-lo	ng	L	eari	ning;
		S1.Software Engineering; S2.Data E	Base	e M	ana	iger	ner	t; S	3. W	'eb I	Des	sign						

### 4. Curricular Gap and Content

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

Mod	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
ules					
1	Substations	Seminar		Mr Avinash S, SKIT	PO1, PO2, PO3
					and PO5
2	Winding terminologies	Seminar		Mr Avinash S, SKIT	PO1, PO2,PO3
					and PO5
5	Alternators	Seminar		Mr Avinash S, SKIT	PO1, PO2,PO3
					and PO5

## 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.

Mod	Title	Teach		No o	fauest	ion in	Fxam		CO	Levels
ules		Hours	CIA-1	CIA-2	CIA-3	Asg	Extra	SEE		201010
							Asg			
1	Winding Diagrams	10	1	-	-	1	1	2	CO1, CO1	L3
2	Single Line Diagrams	10	1	-	-	1	1	1	CO2, CO2	L4
3	Electrical Machine Assembly	10	-	1	-	1	1	1	CO3, CO3	L4
	Drawings Using Design Data,	,								
	Sketches or Both (Transformer)									
4	Electrical Machine Assembly	10	-	1	1	1	1	1	CO3, CO3	L4
	Drawings Using Design Data,									
	Sketches or Both (DC Machine)									
5	Electrical Machine Assembly	10	-	-	1	1	1	1	CO3, CO3	,L4
	Drawings Using Design Data,	,								
	Sketches or Both (Alternator)									
-	Total	50	2	2	2	5	5	6	-	-

### 2. Continuous Internal Assessment (CIA)

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

Mod	Evaluation	Weightage in	СО	Levels
ules		Marks		
1, 2	CIA Exam – 1	30	CO1, CO1, CO2,CO2	L4,L4,L3,L3
3, 4	CIA Exam – 2	30	CO3, CO3, CO3, CO3	L4,L4,L3,L4
5	CIA Exam – 3	30	CO3, CO3	L3,L2
1, 2	Assignment - 1	10	CO1, CO1, CO2,CO2	L4,L4,L3,L3
3, 4	Assignment - 2	10	CO3, CO3, CO3, CO3	L4,L4,L3,L4
5	Assignment - 3	10	CO3, CO3	L3,L2
	Final CIA Marks	40	-	-

## D1. TEACHING PLAN - 1

#### Module - 1

Title:	Winding Diagrams	Appr	12 Hrs
		Time:	
a	Course Outcomes	CO	Blooms
-	At the end of the topic the student should be able to	-	Level
1	Interpret the notations and formulas required and design the winding diagrams of AC and DC machines.	CO1	L3
b	Course Schedule	-	-
Class No	Portion covered per hour	-	-
1	Winding Diagrams introduction	CO1	L2
2	Developed Winding Diagrams of D.C. Machines	CO1	L3
3	Simplex Double Layer Lap Windings	CO1	L3
4	Simplex Double Layer Wave Windings	CO1	L3
5	Dummy coil problem on wave winding	CO1	L3
6	Developed Winding Diagrams of A.C. Machines	CO1	L2

7	Integral and Fractional Slot Double Layer Three Phase Lap	CO1	L3
8	Wave Windings	CO1	L3
9	Single Layer Windings – Un-Bifurcated 2 and 3 Tier Windings	CO1	L3
10	Mush Windings, Bifurcated 3 Tier Windings	CO1	L3
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to	-	-
1	Design DC windings	CO1	L3
2	Design AC windings	CO1	L3
d	Review Questions	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Draw the armature winding of a DC machine with 4 poles, 14 slots, double	CO1	L3
	layer progressive lap show the position of brush & direction of induced emf.		
	Draw the sequence diagram		
2	Develop a double layer winding for a DC machine having 16 slots and 4 poles.	CO1	L3
	Mark the poles. Draw the sequence diagram. Indicate the position of the		
	brushes; show the direction of induced emf give equalizer connection	0.0	
3	Draw the developed diagram of a DC machine with the following details. No of	CO1	L3
	poles =4, no of slots=26 the winding is double layer lap type, fix the poles draw		
4	Design & draw the developed double layer lap winding of DC armsture with	CO1	
4	Design & draw the developed double layer lap winding of DC annature with	COI	∟3
	brush position Draw the sequence diagram		
5	Draw the developed winding diagram of a six pole eighteen armature slots	CO1	12
5	double laver full pitch lap wound DC generator fix the poles. Draw the	001	L3
	sequence diagram, fix the position and polarity of brushes. Mark the direction		
	of rotation of armature.		
6	Draw the developed winding diagram of a 4 pole 15 slots double laver lap	CO1	L3
	wound DC generator; show the position and polarity of brush by sequence		Ű
	diagram		
7	Design and draw a duplex winding diagram of a Dc machine with 32	CO1	L3
	conductors and 4 poles. Draw the sequence diagram. Fix the position and		
	polarity of brushes.		
8	Design and draw a wave winding (progressive) for an armature with 34	CO1	L3
	conductors accommodated 17 slots. Draw the sequence diagram show		
	position of brush, direction of current etc.	001	
9	Draw the simplex retrogressive wave winding with a 4 pole DC machine	CO1	L3
	naving 42 armature conductors, 21 stots. The winding is doubte layer. Draw the		
10	Draw the developed winding diagram of the armature of the DC machine with	CO1	1.2
10	the following data. Number of poles=4. Number of Slots=12 Type of winding:	COI	3
	Simplex wave		
11	Design and draw a wave winding (progressive) for an armature with 36	CO1	3
	conductors accommodated in 18 slots. Draw the sequence diagram show	001	
	position of brush, direction of current etc		
12	Design and draw Developed duplex Winding Diagram for a 16 slots, double	CO1	L3
	layer, 4-pole, Progressive lap winding. Draw the sequence diagram		
13	Design and draw Developed Winding Diagram for a 18 slots, 36 conductors,	CO1	L3
	double layer, 4-pole, duplex DC Progressive WAVE winding		
14	Design and draw Developed duplex Winding Diagram for a 16 slots, double	CO1	L3
	layer, 4-pole, Retrogressive lap winding. Draw the sequence diagram		
15	Design and draw Developed Winding Diagram for a 23 slots, 46 conductors,	CO1	L3
	double layer, 6-pole, duplex DC Progressive WAVE winding		
16	Design and draw Developed duplex Winding Diagram for a 18 slots, double	CO1	L3
	layer, 4-pole, Progressive lap winding. Draw the sequence diagram		
17	Design and draw Developed Winding Diagram for a 23 slots, 46 conductors,	CO1	L3
-	double layer, 6-pole, duplex DC retrogressive WAVE winding.		
18	Draw the developed winding diagram for an AC machine with following	CO1	L3

	details: a) Poles = 4 b) phases= 3 c) Slots =24 d) winding = single coil short pitched by one slot lap winding star connected		
19	Draw the developed winding diagram of a 3 phase induction motor, which have 18 slots 2 poles, winding is chorded by 2 slots, double layer lap delta connection	CO1	L3
20	Design and draw the developed winding diagram for an alternator with following details No. of poles =2 No. of phase =3 No .of slots =15 Winding = double layer, lap short pitched by one slot	CO1	L3
21	Draw the developed winding diagram for an diagram for AC three phase rotating machine with the following details 4 poles, 36 slots each slots contains one coil side lap winding connected in star& bring out the details as A,B,C & N winding be full pitched	CO1	L3
22	Draw a developed winding diagram for an AC machine having 24 slots, one conductor per slots 4 poles & delta connected	CO1	L3
23	Design and draw developed winding diagram of an AC machine with following details: No of poles= 4 No of slots= 36 No. of phase=3 Single layer lap, star connected	CO1	L3
24	Design and draw developed 3 phase full pitched AC lap winding for 24 conductor, double layer, 4poles, also show winding in star connection	CO1	L3
25	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots= 36 full pitch lap winding double layer and delta connected.	CO1	L3
26	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 full pitch wave winding	CO1	L3
27	Design and draw the developed winding diagram of an AC motor having the following details. No. of phase= 3 No. of slots = 12 No. of poles = 4 double layer full pitch wave with star connections.	CO1	L3
28	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 wave winding chorded by one slot	CO1	L3
29	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 Un-bifurcated winding in 2 tiers.	CO1	L3
30	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 6 No. of slots = 36 Unbifurcated winding in 2 tiers	CO1	L3
31	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 mush winding.	CO1	L3
32	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 single layer bifurcated winding arranged in 3 tiers.	CO1	L3
33	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 36 mush winding.	CO1	L3
34	Draw the developed winding diagram of an 3 phase induction motor, which have 18 slots 6 poles,2 coil sides / slot , full pitch, star connected lap winding.	CO1	L3
35	Draw the developed winding diagram for an AC machine with following details: a) Poles = 4 b) Phases = 3 c) Slots =36 d) Double layer, short pitched by one slot, lap winding star connected.	CO1	L3
36	Draw the developed winding diagram for an AC machine with following details: a) Poles = 4 b) Phases = 3 c) Slots =21 d) Double layer, lap winding star connected.	CO1	L3
37	Draw the developed winding diagram for an AC machine with following details: a) Poles = 4 b) Phase= 3 c) Slots =30 d) double layer, lap winding star connected.	CO1	L3
38	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 full pitch wave winding.	CO1	L3

е	Experiences	-	-
1			

Title:	Single Line Diagrams	Appr Time:	7 Hrs
a	Course Outcomes	СО	Blooms
-	At the end of the topic the student should be able to	-	Level
1	Develop a layout for substation using the standard symbols for substation equipment	CO2	L4
h	Course Schedule	_	_
Class No	Portion covered per hour		_
13	Itroduction Power Transformers Circuit Breakers Isolators	CO2	12
1/	Farthing Switches Instrument Transformers	CO2	12
1		<u> </u>	
15	Surge of Lightining Arresters	$CO_2$	
17	Communication Devices (Power Line Camer) and Line Trap.	<u> </u>	
10	Single Line Diagrams of Substations Covering Incoming Circuits	$-CO_2$	
10	Single Line Diagrams of Outgoing Circuits	$-CO_2$	
19	Single Line Diagrants of Outgoing Circuits.		
10	Sectionalized Double Rus. One and a Half Circuit Breaker Arrangement. Ping		
19	Main		L3
20	Single Line Diagrams: Single Line Diagrams of Generating Stations	CO2	L4
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to	-	-
1	Substation Equipments	CO2	L4
2	Layout of Substation and generating station	CO2	L4
d	Review Questions	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Draw a single line Diagram of connections of hydroelectric station having the	CO2	L4
	Following equipment		
	a. Allemators, 12MVA, $3\Psi$ , 50 Hz, 11KV, Y-connected, Five.		
	b. Step-up transformers. 5000 KVA, $3\Psi$ , 50 Hz, 11/ 110KV, $\Delta$ / F-connected, Five.		
	d. Outgoing transmission lines:110KV two		
	e. Station Auxiliary Tranformers:750 KVA . 3. 50 Hz .11KV //Y.Two		
	f. Also indicate positions of CT. PT. Isolating Switches. Lightning arrestors.		
	Circuit Breakers.		
2	Draw a single line diagram of a 66KV MUSS with the following details.	CO2	L4
	a. 66KV incoming lines, 2 nos		
	b. Step down transformer 66KV/11KV ,2 nos		
	c. OCB's for transformer bank on L.I side – 2 nos		
	a. Duplicate bus bars for H.I. and L.I. side to be provided		
	e. Bus couplers for HT side only		
	a LT circuit breakers for feeders-mos		
	h Position of lightning arrestors isolators CT's and PT's are to be indicated		
2	Draw the single line diagram of a generating station having the following	CO2	
	details	002	L-4
	a. Generators :50MVA,11KV,3 <b>Φ</b> Two nos		
	b. Transformers: 50MVA, 11/132KV, 3 <b>Φ</b> . –Two nos		
	c. Transformers(auxiliary):500 KVA , 11000/400 V. – 2 nos		
	d. Transformers(reverse) : 1 MVA , 132/11 KV , 1 no		
	e. Outgoing lines: 132 KV, 3Φ. 2 nos		

	f. Also indicate positions of CT, PT, Isolating Switches, lightning Arrestors, Circuit Breakers.		
4	Draw the single line diagram of a generating station having the following	CO2	L4
	equipment.		
	a. Incoming lines : 110 KV , 50 Hz. – 2nos		
	O Outgoing lines. IIOKV,50 HzI NO O KV 50 Hz -1		
	no 11KV, 50 Hz, -1		
	с. Transformers: 15MVA, 110/66KV, 3Ф, Y2nos		
	10MVA,110/11KV,3 <b>Φ</b> ,Y/Y1no		
	3 MVA, 11/400 KV, 3 <b>Φ</b> , Y/Y1 no		
	d. Bus Bars : 110 KV2nos		
	11 KV - 100		
	400 KV. – 1 no		
	Show the positions of CT , PT , Isolating Switches , Lightning arrestors , Circuit		
	Breakers.		
5	Draw the single line diagram of a generating station having the following equipment.	CO2	L4
	a. Incoming lines : 110 KV , 50 Hz. – 2nos		
	b. Outgoing lines: 110KV,50 Hz1 no		
	c. Transformers' 5MVA 110/11KV 3 $\Phi$ 2nos		
	15MVA, 110/220KV, 3Φ,1no		
	500 MVA, 11/400 KV, 3Φ, /Y1 no.		
	One Auxiliary station Transformers		
6	Draw the single line diagram of a generating station having the following	CO2	L4
	equipment. a Incoming lines: 110 KV/ 50 Hz = 1 no		
	b. Outgoing lines: 13.2 KV,50 Hz3 nos		
	11KV, 50 Hz4 nos		
	c. Transformers: 15MVA,110/13.2KV ,3 $\Phi$ , $\Delta$ / Y1no		
	8 MVA,110/11KV,3 $\Phi$ , $\Delta$ /Y1no		
	e Bus Bars : 110 KV-1no		
	11 KV 1no		
	Show the positions of CT, PT, Isolating Switches , Lightning arrestors , Circuit		
	Breakers.		
7	Draw the single line diagram of a substation having the following equipment.	CO2	L4
	a. Incoming lines : 11KV , 50 Hz. – 2 nos b. Outgoing lines : 22 KV , 50 Hz. – 4 nos		
	c. Transformer: $11/33$ KV: $3\Phi$ : Y- $2 nos$		
	d. Bus bars :11 KV , 1 no		
	33 KV, 2 nos		
	Show the positions of CT, PT, Isolating Switches, Lightning arrestors, circuit		
Q	Dreakers.	COa	
	and also mentioning all major parts and equipments.	002	L4
9	Draw the single line diagram of a typical substation with the data of the	CO2	L4
	equipment given below:		
	b. Two transformers of 110/11KV		
	c. Double bus bars for high tension and low tension sides have to indicated		
	d. Bus couplers on the high tension side only.		
	e. Feeders of 11KV at low tension side total no=6.		
	In appropriate position indicate lightning arrestors, CT , PT , earthing switches ,		
	wave uaps and coupling. Condensers at incoming lines and station auxiliary transformers of 11		
	KV/415 V.		
10	Draw a neat Single line diagram for a 110KV/11KV MUSS with following details:	CO2	L4

	a. 110 KV incoming lines. – 2 nos b. Line O.C.B 110KV2nos c. Transformer stepdown 110KV/11KV. – 2 nos d. Lowtension O.C.B for transformer : 2 nos e. Duplicate bus bars on HT & LT sides to be indicated. f. Bus Coupler on H.T side only. g. Feeders 11 KV at LT bus :6 nos h. Station supply transformer 11 KV / 415 V to be shown at Low tension side. i. Low tension circuit breakers for feeders : 6 nos j. In appropriate positions indicate Lightning arrestors , P.T's & C.T's.		
11	Draw the single line diagram of a 33KV/11 KV substation with necessary equipments.	CO2	L4
12	Draw a single line diagram (SLD) of a generating station having the following details. a. Generators: 50 MVA , 11 KV , 3 <b>Φ</b> , 2 nos. b. Transformers: 50 MVA , 11/132kV , 3 <b>Φ</b> , 2 nos. c. HT bus bar in 2 sections d. LT bus bar in 2 sections e. Auxiliary Transfomers:500kVA , 11kV/400V , 1 no. f. Outgoing lines:132kV,3 <b>Φ</b> ,4nos Indicate positions of CBs , Isolating switches , lightning Arrestors, Instrument transformers etc.	CO2	L4
13	Draw a neat single line diagram , for a 110/11kV Main Unit Sub Station (MUSS) with the following details : a. Duplicate incoming lines 110 kV b. Transformer step-down 110/11 kV – 2 nos c. Duplicate bus-bars on H T and LT Sides d. Station supply Transformer 11kV/415V e. Feeder 11kV at LT bus:6 nos f. Earth switch, Wave traps and coupling condensers are to be provided at incoming lines. Also indicate the position of CTs , PTs , isolators and LAs	CO2	L4
е	Experiences	_	_
1			

## E1. CIA EXAM – 1

## a. Model Question Paper - 1

Crs Code	17EE651	Sem:	VI	Marks:	30	Time:	75 minute	S	
Course:	CAED								
	Note: Answ	ver all quest	tions, each	carry equa	l marks. N	10dule : 1, 2	Marks	СО	Level
1	Draw a sing	jle line diagr	am of a 66k	(V MUSS w	ith the fol	lowing details.	10	CO2	L4
	a. 66KV inco	oming lines,	2 nos						
	b. Step dow	n transform	er 66KV/11	KV ,2 nos					
	c. OCB's for	transforme	r bank on L.	T side – 2 n	OS				
	d. Duplicate	e bus bars fo	or H.T and L.	T side to be	e provided	ł			
	e. Bus coup	olers for HT s	side only						
	f. Feeders, 1	11 KV radiati	ng from L.T	bus bars 4	nos				
	g. L.T circuit	t breakers fo	or feeders-4	nos					
	h. Position o indicated.	of lightning a	arrestors, isc	olators, CT's	s and PT's	are to be			
				OR					
2	Draw the si details	ngle line dia	gram of a g	enerating s	station hav	ving the followir	ng 10	CO2	L4
	a. Generato	ors :50MVA,1	1KV,3 <b>Ф</b> Two	o nos					
	b. Transforn	ners: 50MVA	, 11/132KV,	3 <b>Ф</b> . –Тwo r	IOS				
	c. Transform	ners(auxiliar	y):500 KVA ,	11000/400	) V. – 2 nos	5			
	d. Transforn	ners(reverse	e) : 1 MVA , 13	32/11 KV , 1	no				

	e. Outgoing lines: 132 KV, 3Φ. 2 nos f. Also indicate positions of CT, PT, Isolating Switches, lightning Arrestors, Circuit Breakers.			
3	Draw a developed winding diagram for an AC machine having 24 slots, one conductor per slots 4 poles & delta connected	20	CO1	L3
	OR			
4	Develop a double layer winding for a DC machine having 16 slots and 4 poles. Mark the poles. Draw the sequence diagram. Indicate the position of the brushes; show the direction of induced emf give equalizer connection.	20	CO1	L3

### b. Assignment -1

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

	Model Assignment Questions									
Crs Co	de:	17EE651	Sem:	VI	Marks:	10	Time:	90 - 120	minute	S
Course	e:	CAED				Module	: 1, 2			
Note:	Each	student t	o answei	r 2-3 assignn	nents. Each as	signment	carries equal m	ıark.		
SNo				Assignm	ent Description	on		Marks	СО	Level
1	Drav	w the arm	nature wi	nding of a D	C machine w	ith 4 poles	, 14 slots, doub	le 10	CO1	L3
	laye	r progres	sive lap s	show the pos	sition of brush	& directior	n of induced en	nf.		
	Drav	w the seq	uence di	agram						
2	Dev	elop a do	ouble lay	er winding t	for a DC mac	hine havin	g 16 slots and	4 10	CO1	L3
	pole	es. Mark th	ne poles.	Draw the se	equence diagr	ram. Indicat	te the position	of		
	the I	brushes; s	show the	direction of	induced emf	give equali	zer connection			
3	Drav	w the dev	eloped d	iagram of a l	DC machine v	vith the foll	owing details. r	10 10	CO1	L3
	of p	oles =4, no	o of slots	=26 the wind	ling is double	layer lap t	ype, fix the pole	es		
	arav	v the sequ	Jence ala	agram , fix the	e position of p	olarity of tr	ne brusn		001	
4	Desi	ign & ara	w the de	eveloped do	ouble layer la	ip winding	of DC armatu	re 10	CO1	L3
	and	bruch por	sition Dr	a 4 poles. Als	so show the c	arection cu	inent in the co	its		
	Dray	v the dev	alanad w	winding diag	ence diagram	olo oightor	n armaturo do	tc 10	CO1	10
5	dou	hla lavor	full nite	h lan woun	d DC conorat	tor fiv the	noles Draw th	ns 10		L3
	seal	Jence dia	agram f	ix the posit	ion and pola	arity of bri	ushes Mark th	ne		
	dire	ction of ro	tation of	armature.	ion and pole	and y of bit				
6	Drav	w the dev	eloped v	vinding diag	ram of a 4 po	le 15 slots	double laver la	ap 10	CO1	L3
	wou	ind DC ge	enerator;	show the pc	sition and po	larity of bru	ush by sequend	ce		Ŭ
	diag	jram		·	·	,	<i>y</i> (			
7	Desi	ign and d	draw a d	duplex wind	ling diagram	of a Dc r	machine with ;	32 10	CO1	L3
	cond	ductors a	nd 4 pole	es. Draw the	sequence di	agram. Fix	the position ar	nd		
	pola	rity of bru	ishes.							
8	Desi	ign and c	draw a w	vave winding	g (progressive	e) for an a	rmature with :	34 10	CO1	L3
	con	ductors a	ccommo	dated 17 sl	ots, Draw the	e sequenc	e diagram sho	W		
	posi	tion of bru	ush, direc	tion of curre	ent etc.					<u> </u>
9	Drav	w the sim	iplex reti	ogressive w	ave winding	with a 4 p	ole DC machir	ne 10	CO1	L3
	havi	ng 42 arm	nature co	nductors, 21	. slots. The Wi	nding is do	ouble layer. Dra	IW		
10	the s	sequence	alagrari	i snow positi	on of brush, a		the DC measing	10	CO1	
10	Dra	w the dev	velopea v	winding diag	fram of the ar	Inature of	Line DC machin	ne 10	01	∟3
	with	dina Sim	vwiliy ud Vex wave		or poles=4, $N$		Si015=12, 1 ype			
11	Dray	w the dev		<u>,</u> winding dia	aram for an	AC machin	e with followin	10	CO1	12
· · ·	deta	ails' a) Pol	es = 1 h	phases= 3 c	) Slots =2/	d) win	dina = sinale co	-9 IU		L-3
	shor	t pitched	by one s	lot lap windi	ng star conne	ected				

12	Draw the developed winding diagram of a 3 phase induction motor, which have 18 slots 2 poles, winding is chorded by 2 slots, double layer lap delta connection	10	CO1	L3
13	Design and draw the developed winding diagram for an alternator with following details No. of poles =2 No. of phase =3 No .of slots =15 Winding = double layer, lap short pitched by one slot	10	CO1	L3
14	Draw the developed winding diagram for an diagram for AC three phase rotating machine with the following details 4 poles, 36 slots each slots contains one coil side lap winding connected in star& bring out the details as A,B,C & N winding be full pitched	10	CO1	L3
15	Draw a developed winding diagram for an AC machine having 24 slots, one conductor per slots 4 poles & delta connected	10	CO1	L3
16	Design and draw developed winding diagram of an AC machine with following details: No of poles= 4 No of slots= 36 No. of phase=3 Single layer lap, star connected	10	CO1	L3
17	Design and draw developed 3 phase full pitched AC lap winding for 24 conductor, double layer, 4poles, also show winding in star connection	10	CO1	L3
18	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots= 36 full pitch lap winding double layer and delta connected.	10	CO1	L3
19	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 full pitch wave winding	10	CO1	L3
20	Design and draw the developed winding diagram of an AC motor having the following details. No. of phase= 3 No. of slots = 12 No. of poles = 4 double layer full pitch wave with star connections.	10	CO1	L3
21	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 wave winding chorded by one slot	10	CO1	L3
22	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 Un- bifurcated winding in 2 tiers.	10	CO1	L3
23	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 6 No. of slots = 36 Un bifurcated winding in 2 tiers	10	CO1	L3
24	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 mush winding.	10	CO1	L3
25	Draw the developed winding diagram of an AC machine having the following details. No. of phase = 3 No. of poles = 4 No. of slots = 24 single layer bifurcated winding arranged in 3 tiers.	10	CO1	L3
26	Draw the developed winding diagram for an AC machine with following details: a) Poles = 4 b) phases= 3 c) Slots =24 d) winding = single coil short pitched by one slot lap winding star connected	10	CO1	L3
27	Draw the developed winding diagram of a 3 phase induction motor, which have 18 slots 2 poles, winding is chorded by 2 slots, double layer lap delta connection	10	CO1	L3
28	Draw a single line Diagram of connections of hydroelectric station having the following equipment a. Alternators: 12MVA, 3Φ, 50 Hz, 11KV, Y-connected, Five. b. Step-up transformers: 5000 KVA, 3Φ, 50 Hz, 11/110KV, Δ/Y-connected, Five. c. Bus: 110 KV double bus with bus coupler. d. Outgoing transmission lines:110KV,two e. Station Auxiliary Tranformers:750 KVA , 3, 50 Hz ,11KV Δ/Y.Two f. Also indicate positions of CT, PT, Isolating Switches, Lightning arrestors, Circuit Breakers 10	10	CO2	L4
29	Draw a single line diagram of a 66KV MUSS with the following details. a. 66KV incoming lines, 2 nos	10	CO2	L4

20	<ul> <li>b. Step down transformer 66KV/11KV ,2 nos</li> <li>c. OCB's for transformer bank on L.T side – 2 nos</li> <li>d. Duplicate bus bars for H.T and L.T side to be provided</li> <li>e. Bus couplers for HT side only</li> <li>f. Feeders, 11 KV radiating from L.T bus bars 4 nos</li> <li>g. L.T circuit breakers for feeders-4nos</li> <li>h. Position of lightning arrestors, isolators, CT's and PT's are to be indicated.</li> </ul>	10		
30	details a. Generators :50MVA,11KV,3ФTwo nos b. Transformers: 50MVA, 11/132KV, 3Ф. –Two nos c. Transformers(auxiliary):500 KVA , 11000/400 V. – 2 nos d. Transformers(reverse) : 1 MVA , 132/11 KV , 1 no e. Outgoing lines: 132 KV, 3Ф. 2 nos f. Also indicate positions of CT, PT, Isolating Switches, lightning Arrestors, Circuit Breakers.	10	002	L4
31	Draw the single line diagram of a generating station having the following equipment. a. Incoming lines : 110 KV , 50 Hz. – 2nos b. Outgoing lines: 110KV,50 Hz1 no 60KV, 50 Hz1 no 11KV, 50 Hz1 c. Transformers: 15MVA, 110/66KV, 3Φ, Y2nos 10MVA,110/11KV,3Φ,Y/Y1no 3 MVA, 11/400 KV, 3Φ, Y/Y1 no d. Bus Bars : 110 KV2nos 66 KV1 no 11 KV 1 no 400 KV. – 1 no Show the positions of CT , PT , Isolating Switches , Lightning arrestors , Circuit Breakers.	10	CO2	L4
32	Draw the single line diagram of a generating station having the following equipment. a. Incoming lines : 110 KV , 50 Hz. – 2nos b. Outgoing lines: 110KV,50 Hz1 no 11KV, 50 Hz8 nos c. Transformers: 5MVA,110/11KV ,3Ф,2nos 15MVA, 110/220KV,3Φ,1no 500 MVA, 11/400 KV, 3Φ, /Y1 no. One Auxiliary station Transformers	10	CO2	L4
33	Draw the single line diagram of a generating station having the following equipment. a. Incoming lines: 110 KV, 50 Hz. – 1 no b. Outgoing lines: 13.2 KV,50 Hz3 nos 11KV, 50 Hz4 nos c. Transformers: 15MVA,110/13.2KV ,3Φ, Δ/ Y1no 8 MVA,110/11KV,3Φ,Δ/Y1no d. Auxiliary Station transformer : 750 KVA , 11 KV/400 V , Δ/Y1no e. Bus Bars : 110 KV1no 11 KV 1no Show the positions of CT, PT, Isolating Switches , Lightning arrestors , Circuit Breakers.	10	CO2	L4
34	Draw the single line diagram of a substation having the following equipment. a. Incoming lines : 11KV , 50 Hz. – 2 nos b. Outgoing lines : 33 KV , 50 Hz 4 nos c. Transformer: 11/33 KV, 3Φ , Y 2 nos d. Bus bars :11 KV , 1 no 33 KV, 2 nos Show the positions of CT, PT, Isolating Switches, Lightning arrestors, circuit breakers.	10	CO2	L4

35	Draw the single line diagram of a 66 KV sub-station indicating a bus coupler, and also mentioning all	10	CO2	L4
	major parts and equipments.			
36	Draw the single line diagram of a typical substation with the data of the equipment given below: a. Two incoming lines 110 KV b. Two transformers of 110/11KV c. Double bus bars for high tension and low tension sides have to indicated d. Bus couplers on the high tension side only. e. Feeders of 11KV at low tension side total no=6. In appropriate position indicate lightning arrestors, CT , PT , earthing switches , wave traps and coupling . Condensers at incoming lines and station auxiliary transformers of 11 KV/415 V.	10	CO2	L4
37	Draw a neat Single line diagram for a 110KV/11KV MUSS with following details: a. 110 KV incoming lines. – 2 nos b. Line O.C.B 110KV2nos c. Transformer stepdown 110KV/11KV. – 2 nos d. Lowtension O.C.B for transformer : 2 nos e. Duplicate bus bars on HT & LT sides to be indicated. f. Bus Coupler on H.T side only. g. Feeders 11 KV at LT bus :6 nos h. Station supply transformer 11 KV / 415 V to be shown at Low tension side. i. Low tension circuit breakers for feeders : 6 nos j. In appropriate positions indicate Lightning arrestors , P.T's & C.T's.	10	CO2	L4

## D2. TEACHING PLAN - 2

Title:	Electrical Machine Assembly Drawings Using Design Data, Sketches or Both	Appr	10 Hrs
	(Transformers)	Time:	
a	Course Outcomes	СО	Blooms
-	At the end of the topic the student should be able to	-	Level
1	Talk about and development of sectional views of Transformers, DC	CO3	L4
	machines, Alternators and its parts using the design data, sketches.		
h	Course Schedule		
	Dortion covered per hour		
CLASS INO	Transformara Castional Viewa Of Single Care Type Transformera	-	-
21	Transformers - Sectional views of Single Core Type transformers.	003	L3
22	Transformers - Sectional Views Of Single Shell Type Transformers.	CO3	L3
23	Problems	CO3	L4
24	Problems	CO3	L4
25	Problems	CO3	L4
26	Transformers - Sectional Views Of Three Phase Core Type Transformers.	CO3	L3
27	Transformers - Sectional Views Of Three Phase Shell Type Transformers.	CO3	L3
28	Problems	CO3	L4
29	Problems	CO3	L4
30	Problems	CO3	L4
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to	-	-
1	Supply power	CO3	L4
2	Electrical Grids	CO3	L4
d	Review Questions	-	-
-	I he attainment of the module learning assessed through following questions	-	-

1	Following are the details of 3 Φ, core type transformer draw to suitable scale a. Front elevation of transformer assembly right half in section b. Plan of Transformer assembly showing right half in section Core: Laminated steel plates of 0.35 mm Cross section of core = 3 stepped core Diameter of circumscribing circle = 230 mm Overall width = overall height of the core = 980 mm Window height = 470 mm Secondary winding (L.T): Number of turns = 25 Inside Diameter & outside diameter are 250 mm and 271 mm respectively Secondary conductor = 6 strips in parallel, 3 axially and 2 radially each 9.5 mm× 3.2 mm Tape insulation = 0.5 mm Primary Winding (H.T): Number of turns = 750 (8 coils of 83 turns Each , Arranged in 7 layers , height 37.5 mm, 2 coils of 43 turns each , height 23.5 mm) Inside Diameter = 320 mm Outside Diameter = 370 mm	CO3	L4
2	Primary Conductor – 2.54 mm, Dia 3 mm with institution Draw to suitable scale, the half sectional elevation and plan of 10 KVA, 50 Hz, 1100/110V single phase, shell type transformer with the following data: Magnetic Circuit Central leg = 70 mm×93.5mm Outer leg = 70 mm×93.5mm Outer leg = 70 mm×97.5 mm Window = 200 mm × 75 mm HV Winding Number of turns = 1000 Number of layers = 12 Dimensions of insulated conductor = 2.1 mm × 2.1 mm Height of the coil = 178.5 mm The coil is divided into two sections with 6.35 mm duct in between , through which the H V leads are brought out. Dept of each section = 15.6 LV Winding No of turns =100 Wound in 2 sections, layers/ section = 2 Dimensions of insulated conductors = 4.67 mm × 7 mm Height of the insulated coil = 182 mm Depth of each section = 9.94 mm Insulation: Between layers = 0.6 mm Between layers = 0.6 mm Between LV & HV winding =3.81 mm Between LV & HV winding =3.81 mm Between yoke and end of coils ; for LV coils 4 mm mica pad & 5 mm pressboard spacer blocks, for HV coils 3.175 mm mica pad & 7.575 mm press Board spacer blocks.	CO3	L4
3	Draw the following views of a 3 $\Phi$ , core type , 250 KVA, 11KV / 400 V transformer: a. Front elevation full in section b. Plan in full section Dimensions of various parts are given below: Core: Cross section of the core = 3 stepped core Diameter of the circumscribing circle = 24 cm Distance between adjacent core centers = 42.5 cm Yoke: height of the yoke 25 cm <b>LV Winding:</b> Outer diameter of LV Coil = 28.3 cm	CO3	L4

2 · · · · · · · · · · · · · · · · · · ·	Inner diameter of LV coil = 25 cm		
	Height of IV winding = 43.5 cm		
	Number of turns per phase - 12		
	HV Winding: Outer diameter of HV Coil 115 cm		
	The willing, outer latineter of the contraction of the second sec		
	Inner Diameter of HV coll = 34.3 cm		
	height of HV winding = 43.5 cm		
	Number of turns / phase = 572		
	Total Height of the transformer = 100 cm		
Δ	Draw the front elevation left half in section and sectional plan of a 15 KVA . 50	CO3	14
	Hz distribution transformer	005	
	Cross section of the core = 63mm×91.6mm		
	window= 298.5mm ×114.5mm		
	Yoke height = 63.5 mm		
	LV winding:		
	Number of coils on each leg = 1		
	Number of turns $/ coil = 72$		
	Number of lavors /coil = 2		
	Castien of conductor a zomen do Gran		
	Section of conductor = 2./9mm×10.0mm		
	HV winding:		
	Number of coils on each leg = 1		
	Number of turns / coil = 720		
	Number of lavers /coil = 8		
	Cross Section of wire = 2 59mm dia		
	Insulation details:		
	Air change around the core 166 mm		
	All space alound the core = 1.00 mm		
	Insulation between core and LI =		
	1.6mm Insulation on H I = 3 mm		
	Insulation at the top and bottom winding and insulation between layer = 0.35		
	mm Provide 10 mm bolt with sleeve at suitable spacing		
5	Following are the details of a 500 KVA single phase . 6600 / 400 V	CO3	L4
	Transformer: Core: Laminated steel	005	
	platos of 0.25 mm		
	Vidth of the largest stamping 200 mm		
	width of the targest stamping = 200 mm		
	Width of the smallest stamping = 175 mm		
1	Height of the core = 430 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform,		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm,		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm,		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm.		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11; Number of layers / limb = 1		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28 5 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ;		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / Limb = 11 ; Number of Layers / Limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 Layers on each Limb Number of turns = 378 ; Number of turns / Limb = 189		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns / limb = 189 Inside diameter of HV 1 st layer = 415 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns = 378 ; Number of turns / limb = 189 Inside diameter of HV 1 st layer = 415 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns = 378 ; Number of turns / limb = 189 Inside diameter of 1 st layer = 415 mm Outside diameter of 1 st layer = 433 mm Provide diameter of 1 st layer = 433 mm		
	Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns = 378 ; Number of turns = 189 Inside diameter of HV 1 st layer = 415 mm Outside diameter of 1 st layer = 433 mm Inside diameter of HV 2 nd layer = 450 mm		

	Draw the front elevation right half of right limb in section and right half section		
6	Draw the longitudinal sectional view of a limb of a single phase transformer	CO3	L4
	with the following details		
	Diameter of circumscribing circle= 22.6 cm		
	Diameter of LV Winding in 2 layers: inside = 25 cm, outside = 28		
	cm Height of LV winding = 41.2 cm		
	Diameter of HV Winding: inside = 32 cm, outside =36.8		
	cm Height of HV winding = 40 cm		
7	Draw the detailed drilling of each part of 500 KVA , 6600/400 V, single phase	CO3	L4
	power transformer		
	with the following data. Show full assembled plan and elevation		
	Dimension of the core: core construction is		
	cruciform Diameter = 33cm		
	Width of the largest stamping = 33cm		
	Width of the smallest stamping 17.5		
	Cm Height of the core = 43 cm		
	Centre to centre distance between cores = 49 cm		
	Core taminations are used by means of 2 end plates – 3 mm thick by a bolt of		
	CITI Velkor		
	TOKE. Vaka hajaht - 25cm		
	Voke length = 77 cm		
	Total hoight of transformer - 0.2cm		
	Winding		
	Vinding.		
	total turns = 22 No of turns / limb = 11		
	Inside dia of I // Winding = 22.75cm		
	Outside dia of LV winding = 38.35 cm		
	Total height of the core occupied by the LV winding = 36.2cm		
	H.T winding:		
	2 lavers		
	Inside dia of HT 1 st layer		
	= 41.5 cm		
	Outside dia of H.T nd 1 st layer = 43.3 cm		
	Inside dia of HT 2 layer = 45 cm		
	Outside dia of H.T 2 nd layer = 46.8 cm		
8	Draw the sectional plan and elevation of 500 KVA 6600/400 V single phase	CO3	L4
	power transformer with	_	
	the following details		
	Core:		
	Diameter = 33cm		
	Width of the largest stamping = 28cm		
	Width of the smallest stamping 17.5		
	cm Height of the core = 43 cm		
	Centre to centre distance between cores = 49 cm		
	Yoke:		
	Construction : cruciform		
	Yoke height = 25cm		
	Yoke length (49+0.85×33=77cm)		
	Winding:		
	Height of the core occupied by the LV Winding = 36.2cm		
	Inside dia of LV Winding = 33.75cm		
	Outside dia of LV winding =38.35 cm		
	Inside dia of HT 1 st layer		
	= 41.5 cm		
	Outside dia of H.I nd 1 st layer = 43.3 cm		
	Inside dia of H I 2 layer = 45 cm		
	Outside dia of H.T.2 rid tayer = 40.8 cm	00-	1 •
9	juraw to a suitable scale the longitudinal cross section of a limb of a 3 $\Psi$ oil	03	∟4

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			ı
	cooled power		
	transformer snowing the H.I and L.I windings		
	Diameter of circumscribing iron core circle = 22.6 cm		
	Diameter of Secondary winding in 2 concentric layers, inside = 25 cm, outside		
	28.1 cm, neight		
	of secondary winding = 41.2 cm.		
	Diameter of primary winding, inside = 32 cm, outside 36.8cm, height of Primary		
	winding including 10 spacers= 40cm.		
10	Draw the sectional plan of 1 limb showing the winding on a core of an oil-	CO3	L4
	immersed, 12000/550		
	V, 3phase transformer.		
	The core is 24 cm in diameter and has 3 steps.		
	Internal & External diameters of low tension Windings are 25.4 cm & 29.8 cm		
	respectively		
	and of high tension 2.3cm thick and outer diameter 40.5 cm.		
	Show the arrangements for keeping the coils in position and the oil ducts.		
11	The following are the details of three phase core type Transformer. Draw to a	CO3	L4
	suitable scale.		
	a. Elevation of the 3 transformer assembly showing one limb in section		
	b. Plan of Transformer assembly showing one limb in section		
	Core:		
	Step construction, Core diameter = 220mm		
	Height of the core = 480mm		
	Height of the yoke = 250mm		
	centre to centre distance between the limbs =350mm		
	LV winding:		
	Inside diameter = 231 mm		
	Winding is two layer total radial former = 13.3 mm		
	Radial thickness of one layer = 7.4mm		
	Thickness of LV former = 3 mm		
	number of turns / layer = 13		
	Total height of LV Winding = 427 mm		
	H V winding:		
	outside diameter = 340 mm,		
	total number of coils = 12		
	a. Two coils of end gun metal ring each of 14mm thickness		
	b. Ten coils of 56 turns each , total height of winding = 427 mm , average and		
	clearance 33mm		
	from top and 200 mm from bottom of the yoke.		
12	Draw the front elevation left half in section and sectional plan of a 15 kVA ,	CO3	L4
	single phase distribution		
	transformer having the following details of magnetic circuits		
	a. Cruciform cross sectional core = 63mm ×91.6mm		
	b. Window = 298.5mm × 114.5 mm		
	C. Height of the yoke = 63.5 mm		
	Assume suitable value for insulation between between core and LV Winding,		
	LV Winding and H V		
	winding and other data suitably.		
е	Experiences	-	-

Title:	Electrical Machine Assembly Drawings Using Design Data, Sketches or Both	Appr	10 Hrs
	(DC Machines)	Time:	
a	Course Outcomes	СО	Blooms
-	At the end of the topic the student should be able to	-	Level
1	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	CO3	L4

b	Course Schedule		
Class No	Portion covered per hour	-	-
31	Introduction	CO3	L2
32	D.C. Machine - Sectional Views of Yoke with Poles, Armature and Commutator	CO3	L3
	dealt separately.		
33	Problems	CO3	L4
34	Problems	CO3	L4
35	Problems	CO3	L4
36	Problems	CO3	L4
37	Problems	CO3	L4
38	Problems	CO3	L4
39	Problems	CO3	L4
40	Problems	CO3	L4
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to	-	-
1	Sectional views	CO3	L3
2	Source and loads	CO3	L4
d	Review Questions	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Draw the	CO3	L4
	i)half sectional elevation and		
	ii)half sectional end view of a DC machine, with the following details: Shaft		
	diameter = 5 cm		
	Axial length of armature = 25 cm		
	Number of poles = 4		
	I hickness of the yoke = 3.5 cm		
	Pole width = 12 cm		
	Outside diameter of armature = 36 cm		
	Didmeter of commutator = 23 cm		
	Pole height - 16 cm		
	Indicate all the parts		
2	Draw to a suitable scale half sectional end view and longitudinal end view of a	CO3	
	60 H.P. 4 Pole DC	005	-4
	shunt motor, with the following details:		
	Armature:		
	Outside diameter =18.5 cm		
	Length = 13.5cm		
	Number of slots = 24		
	Size of slot = 0.7cm x 2 cm		
	Main pole (laminated):		
	Total height =11 cm Width = 7cm		
	Pole arc = 10 cm		
	Length of pole =14 cm Air gap =0.5 cm		
	Interpole (solid):Size=2x10.8cm		
	Length=11cm		
	Commutator:		
	Lanath =10cm		
	Brush		
	Total no of spindles=4		
	Windina:		
	Main pole=2cm. thick (Shunt winding)		
	Interpole winding = 1 cm thick		
	The armature is directly mounted on the shaft and is held between two end		
	plates. The shaft is supported by means of end shields bearings in the end		

	cover		
2	Draw to a suitable scale and and longitudinal elevation (top balf in section) of	CO2	14
3		003	Ц4
	alou KW, 500V,		
	spider and the shaft is		
	spice and the shart is		
	supported by means of pedestal bearing for the dimensions given below.		
	Armature:		
	Outside diameter= 75 cm		
	Length = 27.8 cm		
	Number of slots = 86		
	Size of slot = 1.11 cm x 5.24 cm		
	Depth of iron behind the slot = 9.26 cm		
	Ventilating ducts= 3, each 1 cm width	1	
	Air gap length below main pole = 0.5 cm	1	
	Main pole (laminated):	1	
	Total height = 24 cm with shoe	1	
	Width = 17.75 cm	1	
	Length = 25.7 cm	1	
	Interpole (solid):		
	Breadth=4.63 cm		
	Length=20 cm		
	Air gap length below Interpole = 0.8 cm		
	Yoke:		
	Thickness of voke = 7.5 cm	1	
	Length of voke = $40 \text{ cm}$	1	
	Commutator:	1	
	Number of commutator segments = $3/4$	1	
	Diameter =56 cm	1	
	Segment pitch = $0.51$	1	
	I = 12.25  cm	1	
	Number of brushes per spindle=2	1	
	Shaft	1	
	Shaft diamotor bolow armaturo - 0 cm	1	
	Shaft longth between bearings contars - 120 cm	1	
	Draw to a quitable scale and view and elevation with top holf in section of a DC	<u> </u>	1.4
4	machine with the	003	∟4
	following details	1	
	jollowing details.	1	
	YOKE.	1	
	Outside diameter = 49.0cm	1	
	Inner ularneter = 40 Cm Axial		
	Lengui = 10 CM		
	Main pole:		
	INUMINER OF POLES = 4 TOTAL		
	neight = 12.0 CM Width =0		
	Air gap = 1.6 mm		
	Interpole :		
	Number of poles= 4		
	lotal height= 11 cm		
	Width =9.5 cm		
	Air gap = 2.5 mm		
5	Following are the details of a main pole of a DC machine. Draw to suitable	CO3	L4
	scale		
	a) Elevation with right half in section		
	b) Plan with right half in section		
	Number of poles- 4		
	Height of pole-140mm		
	Width of the pole-127mm		
	Length of the pole -170mm		
	Armature diameter-400mm		
	Pole arc/ pole pitch =0.67		

	Number of turns per pole -1890		
	Conductor area -1.77mm 2		
	Depth of the winding-45mm		
	Height of the winding-110mm		
	(Missing data may be proportionally assumed)		
6	Draw the plan and elevation (right-half section) of an inter pole or	CO3	L4
	communicating pole used for		
	machine with following dimensions:		
	Height of the nole-120		
	Width of the pole=50		
	l ength of inter pole-170		
	Ne of turns ap		
	NO OF LUTIS=23		
	Area of conductor 5000		
	Area of conductor =50x3		
	All dimensions are in mm	0.0	
7	Draw to half scale sectional end elevation and sectional front elevation of a	CO3	L4
	main pole of Dc machine		
	with following dimensions:		
	Width of the pole=168mm		
	Pole arc=240mm		
	Radius of pole arc =336mm		
	Height of pole with shoe=228mm		
	Height of the pole core=192mm		
	Diameter of rivet used = 9mm		
	Axial length of pole arc=216mm		
	Thickness of yoke=114mm		
	Show the arrangement of fixing pole to yoke.		
8	With the reference to the above problem gives the details of a DC machine.	CO3	L4
	Draw the following		
	assembled view of it, to full scale.		
	a) Half sectional front elevation, showing top half section		
	b) End elevation showing top half in section.		
0	With the problem no 3 show the parts and other details of an armature of a	CO3	LΛ
9	15kw Dc generator	005	<u> </u>
	Draw the assembly of the armature		
	a) Half sectional front elevation (top half in section)		
	b) Half sectional and view		
	Scalo full sizo		
- 10	Solice full Size.	<u> </u>	1.4
10	Pollowing are the design details of an armature used for small DC motor.	03	L4
	Caller diamater 6 a am		
	Collar diameter =0.3 cm		
	Length of the hub =24.75 cm		
	Outer dia. Of armature core =39.6cm		
	Inner dia. Armature core= 20.5 cm		
	Outer dia. Of end ring =34.2 cm		
	Thickness of the end ring = 1.35 cm		
	I hickness of the flange = 0.67 cm		
	Axial length of the core = 24.75 cm		
	Number of armature slot = 48		
	Area of parallel slot= 2.4 x 1.04 cm		
	Draw to 1⁄4 the full size assembled		
	1. Half sectional front elevation		
	2. Half sectional end view		
	Other missing data should be suitably assumed		
11	Draw the suitable scale:	CO3	L4
	a) End view with quarter half in section		
	b) Front elevation with top half in section		
	With following main dimensions of a commutator used for dc		
	machine. Commutator dia = 83.5		
	Length of commutator		

	=86 Length of riser = 10		
	Width of the riser =5.1		
	Thickness of mica =		
	1.25 Shaft dia. = 29.2		
	Segment pitch with mica =		
	5 Outer dia of sleeve =78		
	Height of segment = 19		
	Sleeve is fixed by V ring & collar other missing data's may be proportionally		
	assumed (All dimensions are in mm)		
12	Draw to 1⁄4 the scale half sectional elevation of a rotor assembly of DC	CO3	L4
	machine show method of fixing		
	commutator, armature stampings etc, with following main dimensions.		
	Armature core is directly		
	mounted over the shaft.		
	Dia Of shaft = 72 mm		
	Dia Of armature = 325mm		
	Axial length of arm core=162mm		
	Coil over hang =108mm		
	each side One radial ventilating duct=11mm		
	Six axial ventilating duct =11mm		
	Spacing between commutator and armature =50mm		
	Dia Of the commutator =202mm		
	No of segments -152		
	Length of commutator with riser -72mm		
12	Draw to suitable scale	<u> </u>	14
13	a) and view	003	L4
	a) End view		
	D/Longitudinat view Roth top half in soction for a DC motor		
	Dotaile of volco - outer dia - 40 form		
	Details of yoke – Outer ald. =49.00m		
	inner dia = 400m		
	Lengin =10cm		
	Details of main poles – number-4		
	Width- 6.08cm		
	Height=9.6cm		
	Length =12.8Cm		
	Air gap length = 1.6mm		
	Details of inter pole- number = 4		
	Width = 9.5cm		
	Height= 11		
	Air gap= 2.5mm		
14	Following are the details of 4 pole, 100kW, and DC motor	CO3	L4
	Main pole		
	inter pole		
	Height =148.5mm		
	height=145.8mm		
	Width= 94.5mm		
	length=148.5mm		
	Pole arc= 135mm		
	thickness of winding =27mm		
	Length =190mm		
	Air gap=5mm		
	Thickness of winding =27mm		
	Commutator		
	Diameter =175.5mm		
	Armature		
	outer dia = 250mm		
	l enath =125mm		
	$\frac{1}{2} = \frac{1}{2}$		
	No of brush / spindle-2		
	innordia _08mm		
	Inner uid. =9011111 Ionath -192 amm		
	ונכווקנוו =102.211111	1	

	Depth of the slot =27mm		
	Width of the slot = 9.4mm		
	Coil over hangs=103mm		
	Outer dia of complete machine =720mm		
	Width of the bed plate =830mm		
	Length of the bed plate=573mm		
	Thickness of bed plate=61mm		
	Length of the yoke=337.5		
	Armature is directly mounted over the shaft. Draw end view & elevation with		
	half section.		
15	Draw to a suitable scale, the following as per main dimensions given below in	CO3	L4
	centimeter scale		
	DC 6 pole, 150HP Motor, Armature diameter = 55cm, Air gap length (radial) 0.5		
	at main poles and 0.6 at interpoles.		
	a. Main poles laminated , Breath =14 cm, Arc=20cm, Height with shoes = 21cm		
	b. Yoke thickness =8.5cm		
	c. Interpole breath = 4 cm		
	d. d. Outside diameter of yoke =115cm		
	The method of fixing the pole lamination and pole to the yoke is to be shown,		
	draw the half-sectional end view (with top half in section) looking from the		
	shaft end. Assume any additional data necessary.		
е	Experiences	-	-
1			

## E2. CIA EXAM – 2

## a. Model Question Paper - 2

Crs Code:	17EE651	Sem:	VI	Marks:	30	Time:	75 minute	S	
Course:	CAED								
-	Note: Answe	er all ques	tions, eac	h carry equal	. marks. N	10dule : 3, 4	Marks	СО	Level
1	Draw to suita Hz , 1100/110 data: Magnetic Cir Central leg = Outer leg = 7 Yoke = 70 mr Window = 20 HV Winding Number of ta Dimensions of Height of the The coil is di through whice leads are bro Dept of each LV Winding No of turns = Wound in 2 s Dimensions of Height of the Depth of each Insulation: Between lay Between cor Between LV	able scale oV single p cuit 70 mm × 92 0 mm × 46 m × 57.2 m 00 mm × 75 00 mm	, the half s phase , she 3.5mm 5.7 mm 5 mm 5 mm 5 mm 15.6 4 conduct 15.6 4 yers/ sec d conduct 1 coil = 182 = 9.94 mm hm winding = 2 ling = 3.81 r	ectional eleva ell type transfo ons with 6.35 r tion = 2 cors = 4.67 mm mm	ation and ormer wit 2.1 mm nm duct 1 × 7 mm	plan of 10 KVA , (	50 15	CO3	L4

			Between yoke and end of coils ; for LV coils 4 mm mica pad & 5 mm pressboard spacer blocks, for HV			
			coils 3.175 mm mica pad & 7.575 mm press Board spacer blocks.			
ł			OR			
	2		Draw the following views of a $3\Phi$ , core type, 250 KVA, 11KV / 400 V transformer: a. Front elevation full in section b. Plan in full section Dimensions of various parts are given below: Core: Cross section of the core = 3 stepped core Diameter of the circumscribing circle = 24 cm Distance between adjacent core centers = 42.5 cm Yoke: height of the yoke 25 cm LV Winding: Outer diameter of LV Coil = 28.3 cm Inner diameter of LV coil = 25 cm Height of LV winding = 43.5 cm Number of turns per phase = 12 HV Winding: Outer diameter of HV Coil = 41.5 cm Inner Diameter of HV coil = 34.3 cm height of HV winding = 43.5 cm Number of turns / phase = 572 Total Height of the transformer = 100 cm	15	CO3	
$\left  \right $						
	3	a	Draw to a suitable scale, the following as per main dimensions given below in centimeter scale DC 6 pole, 150HP Motor, Armature diameter = 55cm, Air gap length (radial) 0.5 at main poles and 0.6 at interpoles. a. Main poles laminated , Breath =14 cm, Arc=20cm, Height with shoes=21cm b. Yoke thickness =8.5cm c. Interpole breath = 4 cm d. d. Outside diameter of yoke =115cm The method of fixing the pole lamination and pole to the yoke is to be shown, draw the half- sectional end view (with top half in section) looking from the shaft end. Assume any additional data necessary.	15	CO3 & CO3	L4
			OR			
	4	a	Draw to 1/4 the scale half sectional elevation of a rotor assembly of DC machine show method of fixing commutator, armature stampings etc, with following main dimensions. Armature core is directly mounted over the shaft. Dia Of shaft = 72 mm Dia Of armature = 325mm Axial length of arm core=162mm Coil over hang =108mm each side One radial ventilating duct=11mm Six axial ventilating duct =11mm Spacing between commutator and armature =50mm Dia. Of the commutator =202mm No of segments =153 Length of commutator with riser =72mm	15	CO3 & CO3	L4

### b. Assignment – 2

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

Model Assignment Questions									
Crs Code:	17EE651	Sem:	VI	Marks:	10	Time:	90 – 120 minutes		S
Course:	Course: CAED Module : 3, 4								
Note: Each	student to	answer 2-3	assignmer	its. Each assi	gnment car	ries equal m	ark.		
SNo U	SNo U Assignment Description						Marks	СО	Level
S			-	-					
N									

			00-	1.
1	Following are the details of 3 $\Phi$ , core type transformer draw to suitable	10	CO3	L4
	scale			
	a. Front elevation of transformer assembly right half in section			
	h Plan of Transformer assembly showing right half in section			
	Correl			
	Core.			
	Laminated steel plates of 0.35 mm			
	Cross section of core = 3 stepped core			
	Diameter of circumscribing circle = 230 mm			
	Overall width - overall height of the core - 080 mm			
	overall width = overall neight of the core = 900 mm			
	Window neight = 470 mm			
	Secondary winding (L.T):			
	Number of turns = 25			
	Inside Diameter & outside diameter are 250 mm and 271 mm respectively			
	Secondary conductor - 6 strips in parallel, a avially and a radially each of			
	Secondary conductor = 0 strips in parallet, 3 axially and 2 radially each 9.5			
	mm			
	× 3.2 mm			
	Tape insulation = 0.5 mm			
	Driman (Winding (HT))			
	Finitely when g (1.17).			
	Number of turns = $750$			
	(8 coils of 83 turns Each , Arranged in 7 layers , height 37.5 mm, 2 coils of 43			
	turns each , height 23,5 mm)			
	Inside Diameter = 320 mm Outside			
	Diameter 270 mm			
	Primary Conductor – 2.64 mm , Dia : 3 mm with insulation			
2	Draw to suitable scale , the half sectional elevation and plan of 10 KVA , 50	10	CO3	L4
	Hz . 1100/110V sinale			
	phase, shell type transformer with the following data:			
	Magnetia Circuit			
	Magnetic Circuit			
	Central leg = 70 mm×93.5mm			
	Outer leg = 70 mm × 46.7 mm			
	Yoke = 70 mm × 57.2 mm			
	Window - 200 mm - 75 mm			
	W (M, Z) = 200 $W (M, Z) = 200$ $W (M$			
	HV winding			
	Number of turns = 1000			
	Number of layers =12			
	Dimensions of insulated conductor = 21 mm $\times$ 21 mm			
	Union of the coil - 179 c mm			
	The coll is divided into two sections with 6.35 mm duct in between , through			
	which the H V			
	leads are brought out.			
	Dept of each section = $15.6$			
	Lv winding			
	No of turns =100			
	Wound in 2 sections, layers/ section = 2			
	Dimensions of insulated conductors = 4.67 mm × 7 mm			
	Height of the insulated coil = $182 \text{ mm}$			
	Dopth of open section			
	Depth of each section = 9.94 mm			
	Insulation:			
	Between layers = 0.6 mm			
	Between core and LV winding = 2.5 mm			
	Between LV & HV winding = 3.81 mm			
	Botwoon voko and ond of coils : for LV coils 4 mm mica had & 5 mm			
	between yoke and end of coils, for LV coils 4 Hitt Hild paulo 5 Hitt			
	pressioard spacer blocks, for HV			
	coils 3.175 mm mica pad & 7.575 mm press Board spacer blocks.			
3	Draw the following views of a $3\Phi$ , core type, 250 KVA, 11KV / 400 V	10	CO3	L4
	transformer:			
	a Front elevation full in section			
	a none devalor null in section			
	D. Plan in Tull Section			
	Dimensions of various parts are given below:			
	Core: Cross section of the core = 3 stepped core			
	Diameter of the circumscribing circle = 24 cm			

<ul> <li>Distance between adjacent core centers - 4.2.5 cm</li> <li>VWeinding: Outer clameter of LV Coll - 28.3 cm</li> <li>Inner diameter of LV coll - 28.3 cm</li> <li>Height of LV winding - 43.5 cm</li> <li>Number of LV coll - 32.5 cm</li> <li>Number of LV coll - 34.5 cm</li> <li>Section of Loco core - 63mmsp1.6mm</li> <li>Window- 298.5mm - 144.5mm</li> <li>Vok height - 63.5 mm</li> <li>LV winding:</li> <li>Number of colls on each leg - 1</li> <li>Number of LV coll - 7.2</li> <li>Number of LV coll - 7.2 cmm-10.6mm</li> <li>HV winding:</li> <li>Number of LV coll - 7.2 mm</li> <li>Section of conductor - 2.7gmm-10.6mm</li> <li>HV winding:</li> <li>Number of LV coll - 7.2 cmm-10.6mm</li> <li>HV winding:</li> <li>Number of LV coll - 7.2 mm</li> <li>Section of conductor - 2.7gmm-10.6mm</li> <li>HV winding</li> <li>Number of LV coll - 7.2 mm</li> <li>Number of LV coll - 2.3 mm</li> <li>Section of vice - 2.5 mm</li> <li>Section of vice - 2.5 mm</li> <li>Section of vice - 2.5 mm</li> <li>Number of LV coll - 2.7 mm</li> <li>Section of vice - 2.5 mm</li> <li>Number of LV coll - 7.2 mm</li> <li>Number of LV coll - 2.3 mm</li> <li>Number of LV coll - 2.3 mm</li> <li>Section of vice - 2.5 mm</li> <li>Number of LV coll - 7.2 mm</li> <li>Section of conductor - 2.8 mm</li> <li>Number of LV coll - 7.2 mm</li> <li>Number of LV coll - 7.2 mm</li> <li>Number of LV</li></ul>					
Voke: height of the yoke 25 cm           VW Winding: Outer diameter of LV Coil - 28.3 cm           Inner diameter of LV coil - 25 cm           Height of LV winding - 33 cm           Number of turns per phase - 12           HV Winding: Outer diameter of HV Coil - 14.5 cm           Inner Diameter of HV coil - 34.3 cm           Number of turns per phase - 572           Total Height of the transformer = 100 cm           Q Draw the front elevation left half in section and sectional plan of a 15 KVA.         10           CO3         L4           So H2 distribution tansformer         Decasits of magnetic circuits:           Cross section of the core - 6 gmm-g16mm         Winding:           Number of coils on each leg - 1         Number of coils on each leg - 1           Number of tayers / coil - 72         Number of tayers / coil - 72           Number of tayers / coil - 720         Number of tayers / coil - 720           Number of tayers / coil - 8         Cross Section of wire - 2.5gmm dia           Insulation at the cop and bottom winding and insulation between layer - 0,35         Cross farm           Glowing are the details of a 500 KVA single phase .6600 / 400 V         10         CO3         L4           Insulation at the top and bottom winding and insulation between layer - 0,35         Cross farm         Coss farm         Cos farm           Insu		Distance between adjacent core centers = 42.5 cm			
LV Winding: Outer diameter of LV Coll - 28.3 cm         Inter of diameter of LV Coll - 28.3 cm           Height of LV winding - 43.5 cm         Number of turns per phase - 12           HVWinding: Outer diameter of HV Coll - 41.5 cm         Inter of HV coll - 34.3 cm           Number of turns per phase - 12         Inter of HV coll - 34.3 cm           Number of turns / phase - 572         Total Height of the transformer = 100 cm         Io           20         Draw the front elevation left half in section and sectional plan of a 15 KVA . 50 Hz distribution transformer         Io         CO3         L4           20         Draw the front elevation left half in section and sectional plan of a 15 KVA . 50 Hz distribution transformer         Io         CO3         L4           21         Draw the front elevation left half in section and sectional plan of a 15 KVA . 50 Hz distribution transformer         Io         CO3         L4           22         By Hz distribution transformer         Io         CO3         L4           23         Section of conductor - 27gmm-10.6m         HV winding.         Io         CO3         L4           34         space around the core - 160 mm         Insulation detalls:         Air space around the core - 160 mm         Insulation detalls:         Air space around the core - 160 mm         Insulation at the top and bottom winding and insulation between layer - 0.35         Io         CO3		Yoke: height of the yoke 25 cm			
Inner clameter of LV coll - 25 cm         Height of LV winding - 33 cm           Number of turns per phase - 12         HV Winding: Outer clameter of HV Coll - 415 cm           Inner Diameter of HV coll - 33 cm         Number of turns / phase - 572           Total Height of the transformer = 100 cm         10           C03         L4           Draw the front elevation left half in section and sectional plan of a 15 KVA.         10         C03         L4           of Hz distribution transformer         Details of magnetic circuits:         Cross section of the core - 6 symm g1.6mm         10         C03         L4           Vumber of colls on each leg - 1         Number of coll - 72         Number of coll - 72         Number of trans / coll - 72           Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72           Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72           Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72           Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72         Number of turns / coll - 72           Number of turns / coll - 720         Number of turns / coll - 72         Number of turns / c		LV Winding: Outer diameter of LV Coil = 28.3 cm			
<ul> <li>Height of LV winding - 43,5 cm</li> <li>Number of turns perphase - 12</li> <li>HVWinding: Outer diameter of HV Coil - 41,5 cm</li> <li>Inner Diameter of HV coil - 34,3 cm</li> <li>height of HV winding - 43,5 cm</li> <li>Number of turns / phase - 572</li> <li>Total Height of the transformer - 100 cm</li> <li>Draw the front elevation left half in section and sectional plan of a 15 KVA,</li> <li>50 F Z distribution transformer - 100 cm</li> <li>Draw the front elevation left half in section and sectional plan of a 15 KVA,</li> <li>50 F Z distribution transformer - 100 cm</li> <li>Draw the front elevation left half in section and sectional plan of a 15 KVA,</li> <li>50 F Z distribution transformer - 100 cm</li> <li>View height - 83,6 mm</li> <li>Number of coils on each leg - 1</li> <li>Number of furns / coil - 72</li> <li>Number of furns / coil - 72</li> <li>Number of layers / coil - 83</li> <li>Cross Section of the core - 166 mm</li> <li>Insulation details:</li> <li>Air space around the core - 166 mm</li> <li>Insulation at the top and bottom winding and insulation between layer - 0,35</li> <li>mm Provide 10 mm bot with sleeve at suitable spacing</li> <li>Following are the details of a 500 KVA single phase , 6600 / 400 V</li> <li>Tonsformer. Core: Laminated steel</li> <li>plates of 0,35 mm</li> <li>Midth of the samplest stamping - 280 mm</li> <li>Width of the samplest stamping - 280</li></ul>		Inner diameter of LV coil = 25 cm			
Number of turns per phase - 12         HV Winding: Outer diameter of HV Coil - 415 cm         Inner Diameter of HV coil - 34.3 cm           Number of turns / phase - 572         Total Height of the transformer - 100 cm         10         CO3         L4           4         Draw the front elevation left half in section and sectional plan of a 15 KVA, 50 Hz distribution transformer         10         CO3         L4           5         Hz distribution transformer         Details of magnetic circuits         10         CO3         L4           Window - 286 5mm + 114 5mm         Yoke height - 635 mm         10         CO3         L4           Number of turns / coil = 72         Number of coils on each leg = 1         10         CO3         L4           Number of layers / coil = 3         Section of conductor = 279mm+10.6mm         10         CO3         L4           Number of layers / coil = 7         Number of layers / coil = 7.8         10         CO3         L4           Number of layers / coil = 7.3         Section of wire 2.89mm dia         11         10         CO3         L4           Number of layers / coil = 7.3         Number of layers / coil = 7.3         10         CO3         L4           Section of wire 2.89mm dia         11         10         CO3         L4           Insulation at the top and bottom winding and		Height of LV winding = 43.5 cm			
HV Winding: Outer diameter of HV Coil - 41.5 cm         Inser Diameter of HV coil - 34.3 cm         Number of turns / phase = 572         Total Height of the transformer - 100 cm         4         Draw the front elevation left half in section and sectional plan of a 15 KVA.         50 H zidstribution transformer         cross section of the core = 63mm.gl.6mm         window- 298 5mm 314.5mm         Yowinding:         Number of layers / coil = 72         Number of layers / coil = 8         Cross Section of wire - 2.5gmm dia         Insulation details:         Air space around the core - 1.66 mm         Insulation between core and LT =         16mm Insulation on H T = 3 mm         Insulation between core and LT =         16mm Insulation on H T = 3 mm         Insulation at the top and bottom winding and insulation between layer -         0.35         5       Following are the details of a 500 KVA single phase , 6800 / 400 V         7       Transformer: Core: Laminated steel         plates 60 .35 mm		Number of turns per phase = 12			
Inner Diameter of HV coil - 34.3 cm       height of HV winding - 435 cm         Number of twis / phase - 572       Total Height of the transformer - 100 cm         4       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         7       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         8       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         9       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         9       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         9       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         10       Windber of colls on each leg = 1       11       Number of layers / coil = 72       Number of layers / coil = 72       Number of tayers / coil = 72       Number of tayers / coil = 72       Number of tayers / coil = 72       Number of layers / coil = 72       Number of tayers / coil = 72       Number of layers / an		<b>HV Winding</b> : Outer diameter of HV Coil = $41.5$ cm			
height of HV winding = 435 cm         Number of turns / phase = 572         Total Height of the transformer = 100 cm         4         Draw the front elevation left half in section and sectional plan of a 15 KVA, 50 Hz distribution transformer         Total Height of the transformer = 100 cm         4         Draw the front elevation left half in section and sectional plan of a 15 KVA, 50 Hz distribution transformer         Cross section of the core = 63mm-91 6mm window- 298 5mm ×114,5mm Voke height = 63,5 mm LV winding: Number of coils on each leg = 1 Number of turns / coil = 72         Number of of coils on each leg = 1 Number of layers /coil = 3         Section of orductor = 2,5gmm+10,6mm HV winding: Number of layers /coil = 720 Number of layers /coil = 3         Section of wire = 2,5gmm dia Insulation at the top and bottom winding and insulation between layer = 0.25 mm Provide 10 mm bolt with sleeve at suitable spacing         5       Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer. Core: Laminated steel plates of 0.35 mm Wridth of the smallest stamping = 175 mm Height of the core = 420 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bott of Diameter - 12mm Yoke : Construction = cruciform, yoke height = 250 mm, Yoke : Construction = cruciform, yoke height = 250 mm, Yoke : Construction = cruciform, yoke height = 250 mm, Yoke : Construction = cruciform, yoke height = 250 mm Totat height of the core ecoupied by the LV winding = 362		Inner Diameter of HV coil = 3/ 3 cm			
Number of turns / phase - 572         Total Height of the transformer - 100 cm         4       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         a       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       CO3       L4         betails of magnetic circuits:       Cross section of the core = 63mm-91.6mm       window-298.5mm       10       CO3       L4         Winber of turns / coil - 72       Number of coils on each leg = 1       Number of turns / coil - 72       Number of coils on each leg = 1         Number of turns / coil - 720       Number of turns / coil - 720       Number of turns / coil - 720         Number of tayers / coil - 8       Cross Section of wire - 2.5gmm dia       10       CO3       L4         insulation details:       Air space around the core - 1.66 mm       11       10       CO3       L4         f       Following are the details of a 500 KVA single phase , 6600 / 400 V       10       CO3       L4         grantschart       Insulation on H T - 3 mm       10       CO3       L4         plates of 0.35 mm       Width of the smallest stamping - 125 mm       10       CO3       L4         plates of 0.35 mm       Width of the smallest stamping - 175 mm       10       CO3       L4		height of HV winding = 43.5 cm			
Addit Height of the transformer - 100 cm         4       Draw the front elevation left half in section and sectional plan of a 15 KVA.       10       C03       L4         50       Hz distribution transformer       Details of magnetic circuits:       Cross section of the core - 6 gmm-91.6mm       Vindow-298 gmm +114.5mm       Yoke height - 63.5 mm       L4         Voke height - 63.5 mm       LV winding:       Number of colls on each leg = 1       Number of colls on each leg = 1       Number of colls on each leg = 1         Number of ollyers / coll - 72       Number of layers / coll - 72       Number of layers / coll - 72       Number of layers / coll - 72         Number of layers / coll - 72       Number of layers / coll - 72       Number of layers / coll - 72         Number of layers / coll - 72       Number of layers / coll - 72       Number of layers / coll - 8         Cross Section of wire - 2 sgmm dia       Insulation layers / coll - 72       Number of layers / coll - 8         Cross Section of wire - 2 sgmm dia       Insulation at the top and bottom winding and insulation between layer - 0.35       Io       C03       C4         Transformer Core: Laminated steel       plates of 0.35 mm       Wridth of the largest stamping - 175 mm       Io       C03       L4         Transformer Core: Laminated steel       plates of 0.35 mm       Number of layers / limb - 13       Section of wire / 280 mm       Io		Number of turns / phase - 572			
India Height of the Unstanding - 120 cm           4         Draw the front elevation left half in section and sectional plan of a 15 KVA.         10         CO3         L4           4         Draw the front elevation left half in section and sectional plan of a 15 KVA.         10         CO3         L4           9         Hz distribution transformer         Details of magnetic circuits         Cross section of the core - 6 gnms 91 6mm         Virial of the Unstanding - 120 KMA         10         CO3         L4           Window: 298 6mm s144.5mm         Yoke height - 63.5 mm         Number of coils on each leg = 1         Number of coils on each leg = 1           Number of coils on each leg = 1         Number of coils on each leg = 1         Number of coils on each leg = 1           Number of coils on each leg = 1         Number of coils on each leg = 1         Number of coils on each leg = 1           Number of tayers / coil - 3         Section of wire - 25 gnm dia         Insulation details:           Air space around the core - 166 mm         Insulation or H T = 3 mm         Insulation or H T = 3 mm           Insulation or H T = 3 mm         Insulation or H T = 3 mm         Insulation or H T = 3 mm           Insulation or H T = 3 mm         Insulation or H T = 3 form         Insulation or H T = 3 form           Insulation or H T = 3 mm         Insulation or H T = 3 form         Insulation         Insulation		Total Height of the transformer - 100 cm			
4       Draw the route terve in the term in section and section at sec		$\frac{1}{1000} = 100 \text{ cm}$	10	<u> </u>	1.4
50 H2 distribution transformer         Details of magnetic circuits:         Cross section of the core - 6gmm×91.6mm         Window: 298 gmm ×14.5mm         Yoke height - 63.5 mm         LV winding:         Number of coils on each leg - 1         Number of avers / coil - 72         Number of coils on each leg - 1         Number of avers / coil - 8         Cross Section of wire = 25gmm dia         Insulation between core and LT -         L6mm Insulation on HT - 3 mm         Insulation at the top and bottom winding and insulation between layer -         0.36         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase . 6600 / 400 V         Transformer Core: Laminated steel         plates of 0.35 mm         Width of the sanglest stamping - 280 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -	4	Draw the front elevation left half in section and sectional plan of a 15 KVA ,	10	CO3	L4
Defails of magnetic circuits:         Cross section of the core - 63mm×91.6mm         window- 298.5mm ×114,5mm         Volve height - 635 mm         LV winding:         Number of turns / coil - 72         Number of layers / coil - 3         Section of conductor - 2.79mm×10.6mm         HV winding:         Number of layers / coil - 3         Section of conductor - 2.79mm×10.6mm         HV winding:         Number of layers / coil - 3         Section of conductor - 2.79mm×10.6mm         HV winding:         Number of layers / coil - 3         Section of wire - 2.59mm dia         Insulation details:         Air space around the core - 166 mm         Insulation between core and L1 -         1.6mm Insulation on H T - 3 mm         Insulation at the top and bottom winding and insulation between layer -         0.35         mm Provide 10 mm bott with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase. 6600 / 400 V         10       CO3         L4         Transformer Core Laminated steel         plates of 0.35 mm         Width of the largest stamping - 280 mm         Vickit of the core - 430 mm         Core Lamination are f		50 Hz distribution transformer			
Cross section of the core - 63mm-91.6mm Window - 298.5mm ×114.5mm Voke height - 63.5 mm LV winding: Number of colls on each leg - 1 Number of tours / coil - 72 Number of colls on each leg - 1 Number of colls on each leg - 1 Number of colls on each leg - 1 Number of tours / coil - 8 Cross Section of wire - 2.59mm dia Insulation details: Air space around the core - 1.66 mm Insulation between core and LT - 1.6mm Insulation on HT - 3 mm Insulation at the top and bottom winding and insulation between layer - 0.35 mm Provide 10 mm bolt with sleeve at suitable spacing 5 Following are the details of a 500 KVA single phase . 6600 / 400 V Transformer: Core: Laminated steel plates of 0.35 mm Width of the largest stamping - 175 mm Height of the core - 430 mm Distance between the centre of the core - 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bott of Diameter - 12mm Yoke : Construction - cruciform, yoke height - 770 mm, Total height of the transformer - 930 mm. LV Winding Helicat type Number of turns - 22 Number of turns - 22 Number of turns - 235 mm Total height of the core occupied by the LV winding ar 337.5 mm and 383 mm respectively HV Winding Concentric type - arranged in 2 layers on each limb Number of turns - 378 : Number of turns - 378 : Number of turns - 736 : Number of turns - 736 : Number of turns - 1 limb - 11 Section of Concentric type - arranged in 2 layers on each limb Number of turns - 1 limb - 180		Details of magnetic circuits:			
<ul> <li>window- 298 5mm ×114,5mm</li> <li>Yoke height - 60 is on each leg = 1</li> <li>Number of coils on each leg = 1</li> <li>Number of turns / coil - 72</li> <li>Number of layers /coil - 3</li> <li>Section of conductor = 2.79mm×10.6mm</li> <li>HV winding;</li> <li>Number of turns / coil = 720</li> <li>Number of layers /coil - 8</li> <li>Cross Section of wire = 2.59mm dia</li> <li>insulation details:</li> <li>Air space around the core = 1.66 mm</li> <li>Insulation details:</li> <li>Air space around the core = 1.66 mm</li> <li>Insulation between core and LT =</li> <li>1.6mm Insulation between to a 50 KVA single phase , 6600 / 400 V</li> <li>10 CO3 L4</li> <li>Transformer. Core: Laminated steel</li> <li>plates of 0.35 mm</li> <li>Width of the largest stamping = 280 mm</li> <li>Width of the smallest stamping = 175 mm</li> <li>Height of the core - 430 mm</li> <li>Distance between the centre of the core = 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -</li> <li>12mm</li> <li>Yoke leight = 770 mm,</li> <li>Total height of the transformer = 930 mm.</li> <li>LV Winding. Helical type</li> <li>Number of turns / Limb - 11. Number of layers / limb - 1</li> <li>Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm</li> <li>mm with insulation</li> <li>Height of one turn = 285 mm</li> <li>Total height of the core ecupied by the LV winding a 3375 mm and 383 mm respectively</li> <li>HV Winding: Concentric type – arranged in 2 layers on each limb</li> <li>Number of turns - 186</li> </ul>		Cross section of the core = 63mm×91.6mm			
Voke height - 635 mm         LV winding:         Number of coils on each leg = 1         Number of tours / coil = 72         Number of conductor - 279mm*10.6mm         HV winding:         Number of tours / coil = 72         Number of tours / coil = 720         Number of tours / coil = 720         Number of tours / coil = 8         Cross Section of wire - 259mm dia         Insulation details:         Air space around the core = 166 mm         Insulation between core and LT -         L6mm Insulation on HT - 3 mm         Insulation at the top and bottom winding and insulation between layer -         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         for Transformer. Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 125 mm         Height of the core - 430 mm         Width of the smallest stamping = 175 mm         Height of the core - 30 mm         Distance between the centre of the core - 400 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a         bolt of Diameter -         12mm         Yoke Construction - cruciform,         Yoke (ength - 770 mm,         Total height of the transformer - 930 mm.		window= 298.5mm ×114.5mm			
LV winding:       Number of coils on each leg = 1         Number of turns / coil = 72         Number of layers / coil = 3         Section of conductor = 2.79mm10.6mm         HV winding:         Number of coils on each leg = 1         Number of layers / coil = 3         Cross Section of wire = 2.59mm dia         Insulation details:         Air space around the core = 166 mm         Insulation between core and LT =         1.6mm Insulation on H T - 3 mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5       Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.36 mm         Width of the smallest stamping - 175 mm         Height of the core - 4.30 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -         12mm         Yoke length = 770 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns > 28 mm         Total height of the core occupied by the LV winding = 362 mm         Inside diameter & 0 LIS mm <td></td> <td>Yoke height = 63.5 mm</td> <td></td> <td></td> <td></td>		Yoke height = 63.5 mm			
Number of coils on each leg = 1         Number of turns / coil = 72         Number of layers / coil = 3         Section of conductor = 2.79mm*10.6mm         HV winding:         Number of turns / coil = 720         Number of turns / coil = 3         Cross Section of wire = 259mm dia         Insulation between core = 166 mm         Insulation at the top and bottom winding and insulation between layer -         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         youth of the largest stamping = 280 mm         Width of the largest stamping = 175 mm         Height of the core = 430 mm         Distance between the centre of the core = 490 mm         Core Laminations are fixed by means of 2 en		LV winding:			
Number of turns / coil = 72         Number of layers / coil = 3         Section of conductor = 2.79mm*10.6mm         HV winding:         Number of layers / coil = 720         Number of layers / coil = 720         Number of layers / coil = 720         Number of layers / coil = 8         Cross Section of wire = 2.59mm dia         Insulation details:         Air space around the core = 166 mm         Insulation between core and LT =         1.6mm Insulation on H T = 3 mm         Insulation at the top and bottom winding and insulation between layer -         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 125 mm         Height of the core - 430 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -         12mm         Yoke : Construction – cruciform, yoke height = 250 mm.         Yoke isoft - 270 mm, Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turms > 22         Number of turms > 25, m		Number of coils on each leg = 1			
Number of layers /coil - 3         Section of conductor - 2.79mm×10.6mm         HV winding:         Number of coils on each leg = 1         Number of turns / coil = 720         Number of layers /coil = 8         Cross Section of wire - 2.59mm dia         Insulation details:         Air space around the core = 1.66 mm         Insulation between core and LT =         1.6mm Insulation on HT = 3 mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase . 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping - 125 mm         Height of the core - 430 mm         Distance between the centre of the core = 490 mm         Core Laminations are fixed by means of 2 end plates 3 mm thickness by a         bolt of Diameter -         12mm         Yoke leight = 250 mm,         Yoke leight = 770 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns > 22         Number of turns > 55         nm with insulation         Height		Number of turns / coil = 72			
Section of conductor = 2.7gmm×10.6mm         HV winding;         Number of cluss or each leg = 1         Number of furns / coil = 720         Number of layers / coil = 8         Cross Section of wire = 2.5gmm dia         Insulation details:         Air space around the core = 1.66 mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5       Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 175 mm         Height of the core - 430 mm         Width of the smallest stamping = 175 mm         Height of the core - 430 mm         Oxer Laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -         12mm         Yoke : Construction – cruciform, yoke height - 770 mm, Total height of the transformer - 930 mm.         LV Winding: Helical type         Number of turns / Limb = 11: Number of layers / limb = 1         Section of Conductor - made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm × 5.5 mm         mm with insulation         Height of the core occupied by the LV winding = 362 mm         Insicle diameter & outside diameter of LV winding are 337		Number of layers /coil = 3			
HV winding:       Number of coils on each leg = 1         Number of toris / coil - 720         Number of layers /coil - 8         Cross Section of wire - 2,5gmm dia         Insulation details:         Air space around the core = 1.66 mm         Insulation ot atails:         Air space around the core = 1.66 mm         Insulation ot atails:         Air space around the core = 1.66 mm         Insulation ot at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 175 mm         Height of the core = 430 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a bott of Diameter -         12mm         Yoke : Construction - cruciform,         Yoke leight = 770 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns - 22         Number of turns - 22         Number of turns - 22         Number of turns - 55 <td< td=""><td></td><td>Section of conductor = 2.79mm×10.6mm</td><td></td><td></td><td></td></td<>		Section of conductor = 2.79mm×10.6mm			
Number of coils on each leg = 1         Number of turns / coil = 720         Section of the core = 1.66 mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase . 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 175 mm         Height of the core = 430 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a         bolt of Diameter -         12mm         Yoke length = 770 mm, </td <td></td> <td>HV winding:</td> <td></td> <td></td> <td></td>		HV winding:			
Number of turns / coil = 720         Number of layers / coil = 8         Cross Section of wire = 2.59mm dia         Insulation details:         Air space around the core = 1.66 mm         Insulation of turns / a mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 280 mm         Width of the smallest stamping = 175 mm         Height of the core = 430 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a         bott of Diameter -         12mm         Yoke : Construction – cruciform,         yoke height = 250 mm,         Yoke length = 770 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns > 110 + 11; Number of layers / limb = 1         Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare         and 55 mm ×55         mm with insulation         Height of the core occupied by the LV windi		Number of coils on each leg = 1			
Number of layers /coil = 8         Cross Section of wire = 2.5gmm dia         Insulation details:         Air space around the core = 1.66 mm         Insulation between core and LT =         1.6mm Insulation on HT = 3 mm         Insulation between core and LT =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 280 mm         Width of the smallest stamping = 175 mm         Height of the core = 4.30 mm         Distance between the centre of the core = 4.90 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -         12mm         Yoke length = 720 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns - 22         Number of turns - 28, mm         Total height of the core eccupied by the LV winding = 362 mm         Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm         respectively         Hv Winding: Concentric type - arranged in 2 layers on each limb         Number of turns = 78 :         Number of t		Number of turns / coil = $720$			
<ul> <li>Number of turns - 2.59mm dia</li> <li>Insulation of wire - 2.59mm dia</li> <li>Insulation details:</li> <li>Air space around the core - 1.66 mm</li> <li>Insulation between core and LT -</li> <li>1.6mm Insulation on H T - 3 mm</li> <li>Insulation at the top and bottom winding and insulation between layer -</li> <li>0.35</li> <li>mm Provide 10 mm bolt with sleeve at suitable spacing</li> <li>5 Following are the details of a 500 KVA single phase . 6600 / 400 V</li> <li>Transformer: Core: Laminated steel plates of 0.35 mm</li> <li>Width of the largest stamping - 128 mm</li> <li>Width of the cargest stamping - 128 mm</li> <li>Width of the cargest stamping - 175 mm</li> <li>Height of the core - 430 mm</li> <li>Distance between the centre of the core - 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -</li> <li>12mm</li> <li>Yoke : Construction - cruciform,</li> <li>yoke height - 250 mm,</li> <li>Yoke length - 770 mm,</li> <li>Total height of the transformer - 930 mm.</li> <li>LV Winding: Helical type</li> <li>Number of turns - 22</li> <li>Number of turns - 285 mm</li> <li>Total height of the core occupied by the LV winding - 362 mm</li> <li>Height of the core occupied by the LV winding are 337.5 mm and 383 mm respectively</li> <li>HV Winding: Concentric type - arranged in 2 layers on each limb</li> <li>Number of turns - 378 ;</li> <li>Number of turns - 378 ;</li> </ul>		Number of lavers /coil - 8			
<ul> <li>Closs Section of where 2.5gmm data insulation details:</li> <li>Air space around the core = 1.66 mm</li> <li>Insulation between core and LT =</li> <li>1.6mm Insulation on HT = 3 mm</li> <li>Insulation at the top and bottom winding and insulation between layer =</li> <li>0.35</li> <li>mm Provide 10 mm bolt with sleeve at suitable spacing</li> <li>5 Following are the details of a 500 KVA single phase . 6600 / 400 V</li> <li>Transformer. Core: Laminated steel</li> <li>plates of 0.35 mm</li> <li>Width of the largest stamping = 280 mm</li> <li>Width of the smallest stamping = 175 mm</li> <li>Height of the core = 4.30 mm</li> <li>Distance between the centre of the core = 4.90 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -</li> <li>12mm</li> <li>Yoke : Construction - cruciform,</li> <li>yoke height = 250 mm,</li> <li>Yoke length = 770 mm,</li> <li>Total height of the transformer = 930 mm.</li> <li>LV Winding: Helical type</li> <li>Number of turns &gt; 122</li> <li>Number of turns &gt; 122</li> <li>Number of turns &gt; 125 mm</li> <li>Height of one turn = 28.5 mm</li> <li>Total height of the core occupied by the LV winding = 362 mm</li> <li>Inside diameter &amp; outside diameter of LV winding are 3375 mm and 383 mm respectively</li> <li>HV Winding: Concentric type - arranged in 2 layers on each limb</li> <li>Number of turns &gt; 78 ;</li> <li>Number of turns &gt; 180</li> </ul>		Cross Section of wire - 2 comm dia			
<ul> <li>Air space around the core = 1.66 mm</li> <li>Insulation between core and LT =</li> <li>1.6mm Insulation on HT = 3 mm</li> <li>Insulation at the top and bottom winding and insulation between layer =</li> <li>0.35</li> <li>mm Provide 10 mm bolt with sleeve at suitable spacing</li> <li>5 Following are the details of a 500 KVA single phase . 6600 / 400 V</li> <li>Transformer. Core: Laminated steel</li> <li>plates of 0.35 mm</li> <li>Width of the largest stamping = 280 mm</li> <li>Width of the angest stamping = 175 mm</li> <li>Height of the core = 430 mm</li> <li>Distance between the centre of the core = 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -</li> <li>12mm</li> <li>Yoke : Construction - cruciform,</li> <li>yoke length = 770 mm,</li> <li>Total height of the transformer = 930 mm.</li> <li>LV Winding: Helical type</li> <li>Number of turns - 22</li> <li>Number of turns - 285 mm</li> <li>Total height of the core occupied by the LV winding = 362 mm</li> <li>Inside diameter &amp; outside diameter of LV winding are 3375 mm and 383 mm respectively</li> <li>HV Winding: Concentric type – arranged in 2 layers on each limb</li> <li>Number of turns - 378 ;</li> <li>Number of turns - 180</li> </ul>		Lioss Section of whe = 2.59mm uid			
Air space around the core = 1.00 mm Insulation between core and LT = 1.6mm Insulation on H T = 3 mm Insulation at the top and bottom winding and insulation between layer = 0.35 mm Provide 10 mm bolt with sleeve at suitable spacing 5 Following are the details of a 500 KVA single phase , 6600 / 400 V Transformer. Core: Laminated steel plates of 0.35 mm Width of the largest stamping = 280 mm Width of the largest stamping = 175 mm Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 22 Number of turns = 420 Number of turns = 425 mm Total height of the core occupied by the LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns _ 180					
Insulation between core and L1 =         1.6mm Insulation on HT = 3 mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 280 mm         Width of the smallest stamping = 175 mm         Height of the core = 430 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a         bolt of Diameter -         12mm         Yoke iconstruction – cruciform,         yoke height = 250 mm,         Yoke length = 770 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns - 22         Number of turns - 5,5         mm with insulation         Height of one turn = 28,5 mm         Total height of the core occupied by the LV winding are 337.5 mm and 383 mm         respectively         HV Winding: Concentric type – arranged in 2 layers on each limb         Number of turns = 378;         Number of turns = 438		Air space around the core = 1.66 mm			
1.6mm insulation on H 1 = 3 mm         Insulation at the top and bottom winding and insulation between layer =         0.35         mm Provide 10 mm bolt with sleeve at suitable spacing         5         Following are the details of a 500 KVA single phase , 6600 / 400 V         Transformer: Core: Laminated steel         plates of 0.35 mm         Width of the largest stamping = 280 mm         Width of the smallest stamping = 175 mm         Height of the core = 430 mm         Distance between the centre of the core = 490 mm         Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -         12mm         Yoke : Construction – cruciform,         Yoke length = 770 mm,         Total height of the transformer = 930 mm.         LV Winding: Helical type         Number of turns > 22         Number of turns > 25 mm         Total height of one turn = 28.5 mm         Total height of the core occupied by the LV winding = 362 mm         Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm         respectively         HV Winding: Concentric type – arranged in 2 la		Insulation between core and LI =			
Insulation at the top and bottom winding and insulation between layer = 0.35 mm Provide 10 mm bolt with sleeve at suitable spacing 5 Following are the details of a 500 KVA single phase , 6600 / 400 V Transformer: Core: Laminated steel plates of 0.35 mm Width of the largest stamping = 280 mm Width of the smallest stamping = 175 mm Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 22 Number of turns / Limb = 11 : Number of layers / Limb = 1 Section of Conductor - made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 738 ; Number of turns = 180		1.6mm Insulation on H I = 3 mm			
0.35 mm Provide 10 mm bolt with sleeve at suitable spacing       10       CO3       L4         5       Following are the details of a 500 KVA single phase , 6600 / 400 V       10       CO3       L4         Transformer: Core: Laminated steel plates of 0.35 mm       Width of the largest stamping = 280 mm       10       CO3       L4         Width of the smallest stamping = 175 mm       Height of the core = 430 mm       10       CO3       L4         Distance between the centre of the core = 490 mm       Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm       10       CO3       L4         Yoke : Construction - cruciform, Yoke length = 770 mm, Total height of the transformer = 930 mm.       LV       Winding: Helical type         Number of turns = 22       Number of turns = 22       Number of turns = 25 mm       5       mm with insulation         Height of one turn = 28.5 mm       Total height of the core occupied by the LV winding = 362 mm       Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively       HV Winding: Concentric type - arranged in 2 layers on each limb       Number of turns = 378 ; Number of turns = 378 ;		Insulation at the top and bottom winding and insulation between layer =			
Imm Provide 10 mm bolt with sleeve at suitable spacing       10       CO3       L4         5       Following are the details of a 500 KVA single phase , 6600 / 400 V       10       CO3       L4         Transformer: Core: Laminated steel       plates of 0.35 mm       0       Width of the largest stamping = 280 mm       10       CO3       L4         Width of the smallest stamping = 175 mm       Height of the core = 430 mm       0       Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -       12mm       Yoke : Construction – cruciform,         Yoke length = 770 mm,       Total height of the transformer = 930 mm.       LV Winding: Helical type       Number of turns = 22         Number of turns = 22       Number of turns = 11; Number of layers / limb = 1       Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm with insulation       Height of the core occupied by the LV winding = 362 mm         Height of the core occupied by the LV winding are 337.5 mm and 383 mm respectively       HV Winding: Concentric type – arranged in 2 layers on each limb       Number of turns = 378;         Number of turns = 137;       Imm       Imm       Imm       Imm		0.35			
5       Following are the details of a 500 KVA single phase , 6600 / 400 V       10       CO3       L4         Transformer: Core: Laminated steel plates of 0.35 mm       Width of the largest stamping = 280 mm       10       CO3       L4         Width of the largest stamping = 175 mm       Height of the core = 430 mm       10       CO3       L4         Distance between the centre of the core = 490 mm       Core laminations are fixed by means of 2 end plates 3 mm thickness by a bott of Diameter - 12mm       10       CO3       L4         Yoke: Construction - cruciform, yoke height = 250 mm, Total height of the transformer = 930 mm. LV Winding: Helical type       10       CO3       L4         Number of turns / Limb = 11; Number of layers / limb = 1       Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation       10       CO3       L4         Height of one turn = 28.5 mm       Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively       10       CO3       L4         HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns = 378 ; Number of turns = 175       10       CO3       L4		mm Provide 10 mm bolt with sleeve at suitable spacing			
Transformer: Core: Laminated steel plates of 0.35 mm Width of the largest stamping = 280 mm Width of the smallest stamping = 175 mm Height of the core = 430 mm Distance between the centre of the core = 490 mm Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke: Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns / Limb = 11 ; Number of layers / Limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns = 778 ; Number of turns = 136	5	Following are the details of a 500 KVA single phase , 6600 / 400 V	10	CO3	L4
<ul> <li>plates of 0.35 mm</li> <li>Width of the largest stamping = 280 mm</li> <li>Width of the smallest stamping = 175 mm</li> <li>Height of the core = 430 mm</li> <li>Distance between the centre of the core = 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -</li> <li>12mm</li> <li>Yoke : Construction - cruciform,</li> <li>yoke height = 250 mm,</li> <li>Yoke : Construction - cruciform,</li> <li>yoke height = 770 mm,</li> <li>Total height of the transformer = 930 mm.</li> <li>LV Winding: Helical type</li> <li>Number of turns - 22</li> <li>Number of turns / Limb = 11 : Number of layers / Limb = 1</li> <li>Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare</li> <li>and 5.5 mm ×5.5</li> <li>mm with insulation</li> <li>Height of the core occupied by the LV winding = 362 mm</li> <li>Inside diameter &amp; outside diameter of LV winding are 337.5 mm and 383 mm</li> <li>respectively</li> <li>HV Winding: Concentric type - arranged in 2 layers on each limb</li> <li>Number of turns = 378 ;</li> <li>Number of turns = 189</li> </ul>		Transformer: Core: Laminated steel			
<ul> <li>Width of the largest stamping = 280 mm</li> <li>Width of the smallest stamping = 175 mm</li> <li>Height of the core = 430 mm</li> <li>Distance between the centre of the core = 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter -</li> <li>12mm</li> <li>Yoke : Construction - cruciform,</li> <li>yoke height = 250 mm,</li> <li>Yoke length = 770 mm,</li> <li>Total height of the transformer = 930 mm.</li> <li>LV Winding: Helical type</li> <li>Number of turns - 22</li> <li>Number of turns / limb = 11 ; Number of layers / limb = 1</li> <li>Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare</li> <li>and 5.5 mm ×5.5</li> <li>mm with insulation</li> <li>Height of the core occupied by the LV winding = 362 mm</li> <li>Inside diameter &amp; outside diameter of LV winding are 337.5 mm and 383 mm</li> <li>respectively</li> <li>HV Winding: Concentric type - arranged in 2 layers on each limb</li> <li>Number of turns = 378 ;</li> <li>Number of turns = 189</li> </ul>		plates of 0.35 mm			
<ul> <li>Width of the smallest stamping = 175 mm</li> <li>Height of the core = 430 mm</li> <li>Distance between the centre of the core = 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm</li> <li>Yoke : Construction – cruciform,</li> <li>Yoke height = 250 mm,</li> <li>Yoke length = 770 mm,</li> <li>Total height of the transformer = 930 mm.</li> <li>LV Winding: Helical type</li> <li>Number of turns = 22</li> <li>Number of turns = 11 ; Number of layers / limb = 1</li> <li>Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm with insulation</li> <li>Height of one turn = 28.5 mm</li> <li>Total height of the core occupied by the LV winding = 362 mm</li> <li>Inside diameter &amp; outside diameter of LV winding are 337.5 mm and 383 mm respectively</li> <li>HV Winding: Concentric type – arranged in 2 layers on each limb</li> <li>Number of turns = 378 ;</li> <li>Number of turns = 175 mm</li> </ul>		Width of the largest stamping = 280 mm			
<ul> <li>Height of the core = 430 mm</li> <li>Distance between the centre of the core = 490 mm</li> <li>Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm</li> <li>Yoke : Construction - cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns &lt; 22 Number of turns = 22 Number of turns / limb = 11; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm vith insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter &amp; outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378; Number of turns = 189</li> </ul>		Width of the smallest stamping = 175 mm			
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Core laminations are fixed by means of 2 end plates 3 mm thickness by a bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns = 11 : Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns = 189		Distance between the centre of the core = $100 \text{ mm}$			
bolt of Diameter - 12mm Yoke : Construction – cruciform, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns / limb = 189		Core laminations are fixed by means of 2 end plates 2 mm thickness by a			
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<pre>voke Construction - Cruchom, yoke height = 250 mm, Yoke length = 770 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter &amp; outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378; Number of turns / limb = 189</pre>		12/11/11 Volko: Construction or uniform			
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Yoke length = 7/0 mm, Total height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378; Number of turns / limb = 189		yoke neight = 250 mm,			
Iotal height of the transformer = 930 mm. LV Winding: Helical type Number of turns = 22 Number of turns / limb = 11 ; Number of layers / limb = 1 Section of Conductor = made of 20 square strips of size 5 mm × 5 mm bare and 5.5 mm ×5.5 mm with insulation Height of one turn = 28.5 mm Total height of the core occupied by the LV winding = 362 mm Inside diameter & outside diameter of LV winding are 337.5 mm and 383 mm respectively HV Winding: Concentric type – arranged in 2 layers on each limb Number of turns = 378 ; Number of turns / limb = 189		Yoke length = 770 mm,			
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Number of turns / limb = 189		HV Winding: Concentric type – arranged in 2 layers on each limb			
Number of turns / limb = 189		Number of turns = 378 :			
		Number of turns / limb = 189			

	Inside diameter of HV 1 st layer = 415 mm			
	Outside diameter of 1 st layer = 433 mm			
	Inside diameter of HV 2 nd layer = 450 mm			
	Outside diameter of HV 2 nd layer = 468 mm			
	Draw the front elevation right half of right limb in section and right half			
	section plan.			
6	Draw the longitudinal sectional view of a limb of a single phase transformer	10	CO3	L4
	with the following details			
	Diameter of circumscribing circle= 22.6 cm			
	Diameter of LV Winding in 2 layers: inside = 25 cm, outside = 28			
	cm Height of LV winding = 41.2 cm			
	Diameter of HV Winding: inside = 32 cm, outside =36.8			
	cm Height of HV winding = 40 cm			
7	Draw the detailed drilling of each part of 500 KVA , 6600/400 V, single	10	CO3	L4
	phase power transformer			
	with the following data. Show full assembled plan and elevation			
	Dimension of the core: core construction is			
	cruciform Diameter = 33cm			
	Width of the largest stamping = 33cm			
	Width of the smallest stamping 17.5			
	cm Height of the core = 43 cm			
	Centre to centre distance between cores = 49 cm			
	Core laminations are used by means of 2 end plates – 3 mm thick by a bolt			
	of dia 1.2cm			
	Yoke:			
	Yoke height = 25cm			
	Yoke length = 77 cm			
	Total height of transformer = 9.3cm			
	Winding			
	l V winding			
	total turns = 22 No of turns / limb = 11			
	Inside dia of LV Winding = 33.75cm			
	Outside dia of LV winding =38.35 cm			
	Total height of the core occupied by the LV winding = 36.2cm			
	HT winding			
	2 lavers			
	Inside dia of HT 1 st laver= /1.5 cm			
	Outside dia of HT nd 1 st layer = $42.2$ cm			
	Inside dia of HT 2 laver - 45 cm			
	Outside dia of HT 2 rd layer - $46.8$ cm			
0	Draw the sectional plan and elevation of rea KVA 6600 (400 V single phase)	10	$CO_2$	14
0	power transformer with	10	002	∟4
	power transformer with			
	li le lollowing details			
	Cole. Diamatar acom			
	Vidth of the largest stamping 28cm			
	Width of the amellest stamping = 200m			
	width of the smallest stamping 17.5			
	Cm Height of the core = 43 cm			
	Centre to centre distance between cores = 49 cm			
	YOKE:			
	roke neight = 250m			
	roke length (49+0.85×33=//CM)			
	Height of the core occupied by the LV Winding = 36.2cm			
	Inside dia of LV Winding = 33.75cm			
	Outside dia of LV winding =38.35 cm			
	Inside dia of H I 1 st layer			
	= 41.5 cm			
	Outside dia of H.T nd 1 st layer = 43.3 cm			
	Inside dia of H I 2 layer = 45 cm			

	Outside dia of H.T 2 nd layer = 46.8 cm			
9	Draw to a suitable scale the longitudinal cross section of a limb of a $3\Phi$ oil	10	CO3	L3
	cooled power transformer showing the H.T and L.T windings			
	Diameter of circumscribing iron core circle = 22.6 cm			
	Diameter of Secondary winding in 2 concentric layers, inside = 25 cm,			
	outside 28.1 cm, height			
	of secondary winding = 41.2 cm.			
	Diameter of primary winding, inside = 32 cm, outside 36.8cm, height of			
	Primary			
	winding including 10 spacers= 40cm.			
10	Draw the sectional plan of 1 limb showing the winding on a core of an oil-	10	CO3	L3
	immersed, 12000/550V, 3phase transformer.		_	
	The core is 24 cm in diameter and has 3 steps.			
	Internal & External diameters of low tension Windings are 25.4 cm & 29.8 cm			
	respectively			
	and of high tension 2.3cm thick and outer diameter 40.5 cm.			
	Show the arrangements for keeping the coils in position and the oil ducts.			
11	Draw the	10	CO3	4
	i)half sectional elevation and		&	
	ii)half sectional end view of a DC machine, with the following details: Shaft		CO3	
	diameter = 5 cm			
	Axial length of armature = $25 \text{ cm}$			
	Number of poles = $1$			
	Thickness of the voke - 2.5 cm			
	Polo width - 12 cm			
	Outside diameter of armature - 26 cm			
	Diameter of commutator - 30 cm			
	Diameter of commutator = $23 \text{ cm}$			
	Dele height 16 cm			
	Pole neight = 10 cm			
	Indicate all the parts			
			001	1 .
12	Draw to a suitable scale half sectional end view and longitudinal end view	10	CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P. 4 Pole DC	10	CO3 &	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P. 4 Pole DC shunt motor, with the following details:	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: Armature:	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: Armature: Outside diameter =18.5 cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: Armature: Outside diameter =18.5 cm Length = 13.5cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: Armature: Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated):	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b>	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b>	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b>	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding)	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: Armature: Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm Commutator: Diameter =13cm Length =10cm Brush: Total no of spindles=4 Winding: Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length =11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end cover	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P. 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length =11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end cover	10	CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end cover Draw to a suitable scale end and longitudinal elevation (top half in section) of a100 KW, 500V,	10	CO3 & CO3 CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end cover Draw to a suitable scale end and longitudinal elevation (top half in section) of a100 KW, 500V, 1250 R.P.M 6 Pole DC shunt generator. The armature is supported over the	10	CO3 & CO3 CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P, 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length=11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end cover Draw to a suitable scale end and longitudinal elevation (top half in section) of a100 KW, 500V, 1250 R.P.M 6 Pole DC shunt generator. The armature is supported over the spider and the shaft is	10	CO3 & CO3 CO3 & CO3 & CO3	L4
12	Draw to a suitable scale half sectional end view and longitudinal end view of a 60 H.P. 4 Pole DC shunt motor, with the following details: <b>Armature:</b> Outside diameter =18.5 cm Length = 13.5cm Number of slots = 24 Size of slot = 0.7cm x 2 cm Main pole (laminated): Total height =11 cm Width = 7cm Pole arc = 10 cm Length of pole =14 cm Air gap =0.5 cm Interpole (solid):Size=2x10.8cm Length =11cm <b>Commutator:</b> Diameter =13cm Length =10cm <b>Brush:</b> Total no of spindles=4 <b>Winding:</b> Main pole=2cm, thick (Shunt winding) Interpole winding = 1 cm thick The armature is directly mounted on the shaft and is held between two end plates. The shaft is supported by means of end shields bearings in the end cover Draw to a suitable scale end and longitudinal elevation (top half in section) of a100 KW, 500V, 1250 R.P.M 6 Pole DC shunt generator. The armature is supported over the spider and the shaft is supported by means of pedestal bearing for the dimensions given below.	10	CO3 & CO3 CO3 & CO3 & CO3	L4

	Outside diameter= 75 cm Length = 27.8 cm Number of slots = 86 Size of slot = 1.11 cm x 5.24 cm Depth of iron behind the slot = 9.26 cm Ventilating ducts= 3, each 1 cm width Air gap length below main pole = 0.5 cm Main pole (laminated): Total height = 24 cm with shoe Width = 17.75 cm Length = 25.7 cm Interpole (solid): Breadth=4.63 cm Length=20 cm Air gap length below Interpole = 0.8 cm Yoke: Thickness of yoke = 7.5 cm Length of yoke = 40 cm Commutator: Number of commutator segments = 344 Diameter =56 cm Segment pitch = 0.51 Length =12.35 cm Number of brushes per spindle=3 Shaft			
	Shaft diameter below armature = 9 cm			
14	Draw to a suitable scale end view and elevation with top half in section of a	10	CO3	L4
	DC machine, with the following details: Yoke: Outside diameter = 49.6cm Inner diameter = 40 cm Axial Length = 16 cm Main pole: Number of poles = 4 Total height = 12.6 cm Width =6 cm Air gap = 1.6 mm Interpole : Number of poles= 4 Total height= 11 cm Width =9.5 cm Air gap = 2.5 mm		& CO3	
15	Following are the details of a main pole of a DC machine. Draw to suitable scale a) Elevation with right half in section b) Plan with right half in section Number of poles- 4 Height of pole-140mm Width of the pole-127mm Length of the pole -170mm Armature diameter-400mm Pole arc/ pole pitch =0.67 Number of turns per pole -1890 Conductor area -1.77mm 2 Depth of the winding-45mm Height of the winding-110mm (Missing data may be proportionally assumed)	10	CO3 & CO3	L4
16	Draw the plan and elevation (right-half section) of an inter pole or communicating pole used for machine with following dimensions:	10	CO3 & CO3	L4

	Height of the pole-130			
	Width of the pole=50			
	Length of inter pole=170			
	No of turns=23			
	Height of winding =110			
	Area of conductor =50x3			
	All dimensions are in mm			
17	Draw to half scale sectional end elevation and sectional front elevation of a	10	CO3	L4
	main pole of Dc machine		&	
	with following dimensions:		CO3	
	Width of the pole=168mm			
	Pole arc=240mm			
	Radius of pole arc =336mm			
	Height of pole with shoe=228mm			
	Height of the pole core=192mm			
	Diameter of rivet used = 9mm			
	Axial length of pole arc=216mm			
	Thickness of yoke=114mm			
	Show the arrangement of fixing pole to yoke.			
18	With the reference to the above problem gives the details of a DC machine.	10	CO3	L4
	Draw the following		&	
	assembled view of it, to full scale.		CO3	
	a) Half sectional front elevation, showing top half section			
	b) End elevation showing top half in section.			
10	With the problem no.3 show the parts and other details of an armature of a	10	CO3	14
-3	15kw Dc generator.	10	&	
	Draw the assembly of the armature		CO3	
	a) Half sectional front elevation (top half in section)		000	
	b) Half sectional end view			
	Scale full size			
20	Following are the design details of an armature used for small DC motor	10	CO2	14
	Diameter of the shaft =5 $4$ cm	10	&	-4
	Collar diameter =6.3 cm		$\tilde{0}$	
	Length of the hub =24.75 cm		003	
	Outer dia Of armature core = $30.6$ cm			
	Inner dia Armature core= 20.5 cm			
	Outer dia. Of end ring = $24.2$ cm			
	Thickness of the end ring = 1.35 cm			
	Thickness of the flance = $0.67$ cm			
	Axial length of the core = $24.75$ cm			
	Number of armature slot = $18$			
	Area of parallel slot= $2.4 \times 1.04$ cm			
	Draw to 1/1 the full size assembled			
	1 Half sectional front elevation			
	2 Half sectional end view			
	Other missing data should be suitably assumed			
21	Draw the suitable scale.	10	CO2	14
	a) End view with quarter half in section	10	203 &	L4
	b) Front elevation with top half in section		CO2	
	With following main dimensions of a commutator used for dc		003	
	machine Commutator dia = $82.5$			
	l ength of commutator			
	=86 Length of riser = 10			
	Width of the riser = 5 1			
	Thickness of mica =			
	1 25 Shaft dia = 20.2			
	Segment nitch with mica =			
	5 Outer dia of sleeve =78			
	Douler dia of scene -/0			
	Sleeve is fixed by V ring & collar other missing data's may be propertionally			
	assumed (All dimensions are in mm)			
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# D3. TEACHING PLAN - 3

Title:	Electrical Machine Assembly Drawings Using Design Data, Sketches or Both	Appr	10 Hrs
	(Alternators)	l ime:	
a	Course Outcomes	CO	Blooms
-	At the end of the topic the student should be able to	-	Level
1	Talk about and development of sectional views of Transformers, DC machines, Alternators and its parts using the design data, sketches.	CO3	L4
		ļ	
b	Course Schedule	-	-
Class No	Portion covered per hour	-	-
41	Introduction	CO3	L2
42	Alternator – Sectional Views of Stator	CO3	L3
43	Alternator – Sectional Views of Rotor	CO3	L3
44	Problems	CO3	L4
45	Problems	CO3	L4
46	Problems	CO3	L4
47	Problems	CO3	L4
48	Problems	CO3	L4
49	Problems	CO3	L4
50	Problems	CO3	L4
С	Application Areas	-	-
-	Students should be able employ / apply the Module learnings to $\ldots$	-	-
1	show interior detail that is too complicated to be shown clearly and dimensioned by the traditional orthographic views and hidden lines.	CO3	L3
2	Generate electric power at power station.	CO3	L4
	Use in paper mills, refineries and numerous other applications	Ŭ	
d	Review Questions	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Draw the armature core and housing assembly of an alternator having the following data: Stamping OD = 405mm Stamping ID = 240mm Housing OD = 455mm Core length = 180mm No of slots = 48 Dimension of slots: Shape = Trapezoidal Total height = 44.3mm Lip Height = 44.3mm Slot opening = 3mm Slot opening = 3mm Slot width at the top = 16mm slot width at bottom (over lips) = 10.76mm Show the fixing of the armature to the housing in both views.	CO3 & CO3	L4
2	Draw the 4 pole salient pole rotor made of integral pole stamping Draw the 4 pole salient pole rotor made of integral pole stamping with the following data – Rotor OD = 225mm Rotor ID = 60mm Pole arc/Pole pitch = 0.74 Pole width = 65mm Damper bars = 5 no. of 10mm diameter. Field winding – 2 stepped in cross section the dimensions are 29mmX10mm and 22mmX8mm Steel rods on each pole body = 44mmX11mm.	CO3 & CO3	L4
3	Draw to scale half sectional end view and front view of alternator with the following data:	CO3 &	L4

	Diameter of shaft = 7.6 cm	CO3	
	Height of pole = 7.6 cm		
	Diameter of frame (outer) = 92 cm		
	Length of yoke = 22 cm		
	Diameter of rotor = 46 cm		
	outer diameter of the stator = 76 cm		
	Number of poles = 10		
	l ength of stator = 16cm		
4	Draw the armature core and bousing assembly of an alternator baying	<u> </u>	1.4
4	blaw the annature core and housing assembly of an alternator having	003	∟4
	the following data: Stamping $OD = 405mm$ Stamping $ID = 240mm$		
	Housing $OD = 455$ mm		
	Core length = 180mm		
	No of slots = $48$		
	Dimension of slots: Shape = Trapezoidal		
	Total height = 44.3mm		
	Lip Height = 4mm		
	Slot opening = 3mm		
	Slot width at the top $-16$ mm		
	slot width at hottom (over lips) $-10.76$ mm		
	Slot which at bottom (over hps) $= 10.70$ mm		
	Show the fixing of the armature to the housing in both views.		
5	Salient pole rotor – 4 pole with integral pole stamping	CO3	L4
	Draw the 4 pole salient pole rotor made of integral pole stamping with the		
	following data –		
	Rotor OD = 225mm		
	Rotor ID = 60mm		
	Pole arc/Pole pitch = 0.74		
	Pole width = 65mm		
	Damper bars = 5 no. of 10mm diameter.		
	Field winding – 2 stepped in cross section the dimensions are 29mmX10mm		
	and 22mmX8mm		
	Steel rods on each pole body = 44mmX11mm.		
6	Draw to scale half sectional end view and front view of alternator with the	CO3	14
Ŭ	following data:		
	Diameter of shaft = 7.6 cm		
	Height of pole = $7.6$ cm		
	Diameter of frame (outer) - 02 cm		
	Longth of volvo - 22 cm		
	Diameter of retor = 46  cm		
	Diameter of foto = 40 cm $= 20$ cm		
	Number of an los 10		
	Number of poles = 10		
	Length of stator = 16cm		
7	Draw to scale half sectional end view and front view of alternator with the	CO3	L4
	tollowing data:		
	Diameter of shaft = 7.6 cm		
	Height of pole = 7.6 cm		
	Diameter of frame (outer) = 92 cm		
	Length of yoke = 22 cm		
	Diameter of rotor = 46 cm		
	outer diameter of the stator = 76 cm		
	Number of poles = 10		
	Length of stator = 16cm		
8	Draw to scale half sectional end view and front view of alternator with the	CO3	Lл
	following data		-4
	Diameter of shaft = $7.6 \text{ cm}$		
	Height of nole - 76 cm		
	Diamotor of framo (outor) - 02 cm		
	Diameter of Hame (Outer) = 92 Cm		
	Length of yoke = 22 cm		
	Diameter of rotor = 40 cm		
	outer clameter of the stator = 76 cm		
1	Number of poles = 10		

	Length of stator = 16cm		
9	Draw to scale half sectional end view and front view of alternator with the	CO3	L4
	following data:		
	Diameter of shaft = 7.6 cm		
	Height of pole = 7.6 cm		
	Diameter of frame (outer) = 92 cm		
	Length of yoke = 22 cm		
	Diameter of rotor = 46 cm		
	outer diameter of the stator = 76 cm		
	Number of poles = 10		
	Length of stator = 16cm		
10	Draw to scale half sectional end view and front view of alternator with the	CO3	L4
	following data:		
	Diameter of shaft = 7.6 cm		
	Height of pole = 7.6 cm		
	Diameter of frame (outer) = 92 cm		
	Length of yoke = 22 cm		
	Diameter of rotor = 46 cm		
	outer diameter of the stator = 76 cm		
	Number of poles = 10		
	Length of stator = 16cm		
е	Experiences	-	-
1			

# E3. CIA EXAM – 3

## a. Model Question Paper - 3

Crs Code	17EE651	Sem:	VI	Marks:	30	Time:	75 minute	es	
Course:	MICROWA	VE AND AI	NTENNAS	ò					
-	Note: Ansv	wer all que	estions, ea	ach carry equa	al marks.	Module : 5	Marks	CO	Level
1	Draw to sc	ale half se	ctional en	d view and fro	nt view of	alternator with	the 15	CO3	L4
	following c		6 0.00						
	Diameter C	radium = 7.0	o cm m						
	Diameter c	of frame (or	111 1tor) - 02 (	m					
	Length of y	voke = 22 c	m						
	Diameter c	of rotor = $\Delta f$	Scm						
	outer diam	neter of the	stator = 7	6 cm					
	Number of	f poles = 10	,						
	Length of s	stator = 16c	m						
				OR					
2	Draw the a	irmature co	ore and ho	ousing assemb	oly of an a	lternator having	15	CO3	L4
	the followi	ng data: St	amping O	D = 405mm St	amping ID	) = 240mm Hous	sing		
	OD = 455m	im							
	Core lengt	h = 180mm	1						
	No of slots	5 = 48 							
		OF SLOES: SI	nape = Tra	ipezoidal					
	l in Height	- 4mm	1						
	Slot openir	-4							
	Slot width	at the top :	= 16mm						
	slot width a	at bottom (	over lips)	= 10.76mm					
	Show the f	ixing of the	e armature	e to the housin	g in both	views.			
		Ŭ			~				
3	Salient pol	e rotor – 4	pole with	integral pole s	stamping				
	Draw the 2	4 pole salie	ent pole r	otor made of	integral p	oole stamping v	vith		
	the followi	ng data –							
	Rotor OD =	225mm							

	Rotor ID = 60mm			
	Pole arc/Pole pitch = 0.74			
	Pole width = 65mm			
	Damper bars = 5 no. of 10mm diameter.			
	Field winding – 2 stepped in cross section the dimensions are			
	29mmX10mm and 22mmX8mm			
	Steel rods on each pole body = 44mmX11mm.			
	OR			
4	Draw to scale half sectional end view and front view of alternator with the	15	CO3	L4
	following data:			
	Diameter of shaft = 7.6 cm			
	Height of pole = 7.6 cm			
	Diameter of frame (outer) = 92 cm			
	Length of yoke = 22 cm			
	Diameter of rotor = 46 cm			
	outer diameter of the stator = 76 cm			
	Number of poles = 10			
	Length of stator = 16cm			

## b. Assignment – 3

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

				Mo	del Assignmei	nt Question	IS			
Crs Co	ode:	17EE651	Sem:	VI	Marks:	10	Time:	90 - 120	minute	S
Cours	e:	CAED				Module	5			
Note:	ote: Each student to answer 2-3 assignments. Each assignment carries equal mar						ark.			
SNo				Assignm	ent Description	on		Marks	CO	Level
1	Drav	w to scale	e half sect	ional end v	view and front	view of al	ternator with th	ne 10	CO3	L4
	follo	owing data	a:							
	Diar	neter of s	haft = 7.6 (	cm						
	Heig	ght of pole	e = 7.6 cm	<b>\</b>						
	Diar	neter of fi	rame (oute	er) = 92 cm						
	Len	gth of yok	(e = 22 cm	100						
	Diar	neter of re	olor = 40 C	III Nator 76 ou						
	Nun	phor of pr		.ator = 70 ci						
	len	ath of stat	tor = 16cm							
2	Dray	w the arm	ature core	and housi	ng assembly (	of an altern	ator having the	10	CO3	Ιı
	follo	wing data	a: Stampin	a OD = 405	mm Stamping	a ID = 240m	m Housing OD	=	000	
	455	mm		9 1-0	,	,,				
	Core	e length =	180mm							
	No	of slots = 4	48							
	Dim	ension of	slots: Sha	pe = Trapez	zoidal					
	Tota	al height =	44.3mm							
	Lip	Height = 4	mm							
	Slot	opening	= 3mm	-						
	Slot	width at I	the top = 1	6mm	-0					
	Slot	width at k	Dottom (ON	/er lips) = 10	).76mm	h atla viavv				
	Sno	w the lixir	ig of the a	rmature to	the housing in	n both view	S.	10	<u> </u>	14
3	Dray	w tho 4 p	olor – 4 pc olo soliont	polo rotor	made of inter	nping aral polo st	tomping with th		03	L4
	folle	w ine 4 pi	) le salier il 2 –	pole loloi		giai pole si	amping with ti			
	Rote	or OD = 22	5mm							
	Rote	or ID = 60r	nm							
	Pole	arc/Pole	e pitch = 0.	74						
	Pole	e width = 6	65mm							
	Dan	nper bars	= 5 no. of 2	LOmm diam	neter.					
	Field	d windin	g – 2	stepped i	n cross sec	tion the	dimensions a	re		

	29mmX10mm and 22mmX8mm Steel rods on each pole body = 44mmX11mm			
4	Draw the armature core and housing assembly of an alternator having the following data: Stamping OD = 405mm Stamping ID = 240mm Housing OD =	10	CO3	L4
	455mm			
	Core length = 180mm			
	Dimension of slots: Shape = Trapezoidal			
	Total height = 44.3mm			
	Lip Height = 4mm			
	Slot opening = 3mm			
	Slot width at the top = 16mm			
	Show the fixing of the armature to the housing in both views.			
5	Salient pole rotor – 4 pole with integral pole stamping	10	CO3	L4
	Draw the 4 pole salient pole rotor made of integral pole stamping with the		Ũ	
	following data –			
	Rotor OD = 225mm			
	Pole arc/Pole pitch = 0.74			
	Pole width = $65mm$			
	Damper bars = 5 no. of 10mm diameter.			
	Field winding – 2 stepped in cross section the dimensions are			
	29mmX10mm and 22mmX8mm			
6	Steel rods on each pole body = 44mmX11mm.	10	CO2	1.4
0	following data:	10	003	L4
	Diameter of shaft = 7.6 cm			
	Height of pole = 7.6 cm			
	Diameter of frame (outer) = 92 cm			
	Length of yoke = 22 cm			
	Diameter of rotor = 40 cm			
	Number of poles = 10			
	Length of stator = 16cm			
7	Draw to scale half sectional end view and front view of alternator with the	10	CO3	L4
	following data:			
	Diameter of shaft = 7.6 cm			
	Height of pole = 7.6 cm Diameter of frame (outer) = 02 cm			
	Length of voke = $22 \text{ cm}$			
	Diameter of rotor = 46 cm			
	outer diameter of the stator = 76 cm			
	Number of poles = 10			
0	Length of stator = 16cm Draw to scale half social and view and front view of alternator with the	10	<u> </u>	
0	following data:	10	003	L4
	Diameter of shaft = 7.6 cm			
	Height of pole = 7.6 cm			
	Diameter of frame (outer) = 92 cm			
	Length of yoke = 22 cm			
	Diameter of rotor = 46 cm			
	Number of poles = 10			
	Length of stator = 16cm			
9	Draw to scale half sectional end view and front view of alternator with the	10	CO3	L4
	following data:			
	Diameter of shaft = 7.6 cm			
	neigni of pole = 7.0 cm Diameter of frame (outer) = 02 cm			

	Length of yoke = 22 cm			
	Diameter of rotor = 46 cm			
	outer diameter of the stator = 76 cm			
	Number of poles = 10			
	Length of stator = 16cm			
10	Draw to scale half sectional end view and front view of alternator with the	10	CO3	L4
	following data:			
	Diameter of shaft = 7.6 cm			
	Height of pole = 7.6 cm			
	Diameter of frame (outer) = 92 cm			
	Length of yoke = 22 cm			
	Diameter of rotor = 46 cm			
	outer diameter of the stator = 76 cm			
	Number of poles = 10			
	Length of stator = 16cm			
11	Draw to scale half sectional end view and front view of alternator with the	10	CO3	L4
	following data:		Ū	
	Diameter of shaft = 7.6 cm			
	Height of pole = 7.6 cm			
	Diameter of frame (outer) = 92 cm			
	Length of yoke = 22 cm			
	Diameter of rotor = 46 cm			
	outer diameter of the stator = 76 cm			
	Number of poles = 10			
	Length of stator = 16cm			
12	Draw the armature core and housing assembly of an alternator having the	10	CO3	L4
	following data: Stamping OD = 405mm Stamping ID = 240mm Housing OD =		-	
	455mm			
	Core length = 180mm			
	No of slots = 48			
	Dimension of slots: Shape = Trapezoidal			
	Total height = 44.3mm			
	Lip Height = 4mm			
	Slot opening = 3mm			
	Slot width at the top = 16mm			
	slot width at bottom (over lips) = 10.76mm			
	Show the fixing of the armature to the housing in both views.			
13	Salient pole rotor – 4 pole with integral pole stamping	10	CO3	L4
	Draw the 4 pole salient pole rotor made of integral pole stamping with the		-	
	following data –			
	Rotor OD = 225mm			
	Rotor ID = 60mm			
	Pole arc/Pole pitch = 0.74			
	Pole width = 65mm			
	Damper bars = 5 no. of 10mm diameter.			
	Field winding - 2 stepped in cross section the dimensions are			
	20mmY10mm and 22mmY8mm			

## F. EXAM PREPARATION

### 1. University Model Question Paper

Course:		CAED Month					Month /	∕ Year	May /	2018
Crs C	Crs Code: 17EE651 Sem: VI Marks: 100 Time:		Time:		180 mi	nutes				
Mod	Mod Note Answer Question 1 and Question 2 From Part-A.						Marks	СО	Level	
ule		Answer Questi	Answer Question 3 or Question 4 From Part-B.							
		Use CAD tool	that satisfies	s the require	ments of sy	llabus is pe	ermitted.			
		Suitable data n	nay be assum	ned if not give	en.					
	Part - A									
1 Design & draw the developed double layer lap winding of DC armatu			rmature	30	CO1	L3				

	with 24 conductor and 4 poles. Also show the direction current in the			
			001	
	Draw a developed winding diagram for an AC machine having 24 slots,	30	CO1	L3
	one conductor per slots 4 poles & delta connected			
2	Draw a neat single line diagram , for a 110/11kV Main Unit Sub Station	20	CO2	L4
	(MUSS) with the following			
	details :			
	a. Duplicate incoming lines 110 kV			
	b. Transformer step-down 110/11 kV – 2 nos			
	c. Duplicate bus-bars on H T and LT Sides			
	d. Station supply Transformer 11kV/415V			
	e. Feeder 11kV at LT bus:6 nos			
	f. Earth switch, Wave traps and coupling condensers are to be provided at			
	incoming lines. Also			
	indicate the position of CTs . PTs . isolators and LAs			
	Part - B			
2	Draw the front elevation left half in section and sectional plan of a 15 $KV/A$	50	$CO_2$	14
5	EQ Hz distribution	50	003	L4
	transformor			
	Details of magnetic circuits:			
	Details of magnetic circuits.			
	Cross section of the core = 03mm×91.0mm			
	window= 298.5mm ×114.5mm			
	Yoke height = 63.5 mm			
	LV winding:			
	Number of coils on each leg = 1			
	Number of turns / coil = 72			
	Number of layers /coil = 3			
	Section of conductor = 2.79mm×10.6mm			
	HV winding:			
	Number of coils on each leg = 1			
	Number of turns / coil = 720			
	Number of layers /coil = 8			
	Cross Section of wire = 2.59mm dia			
	Insulation details:			
	Air space around the core = 1.66 mm			
	Insulation between core and LT =			
	1.6mm Insulation on H T = 3 mm			
	Insulation at the top and bottom winding and insulation between laver =			
	0.35			
	mm Provide 10 mm bolt with sleeve at suitable spacing			
1	Draw the armature core and housing assembly of an alternator baying the	50	$CO_2$	14
4	following data: Stamping OD - 405mm Stamping ID - 240mm Housing OD	50	003	64
	- AFEmm			
	Caro longth 190mm			
	Dimension of eleter Change Transported			
	Dimension of stots. Shape = Irapezoidat			
	lin Lleight (3000			
	LIP Height = 4mm			
	Stot opening = 3mm			
	Slot width at the top = 10mm $(1 + 1)^{-1}$			
	slot width at bottom (over lips) = 10.76mm			
	Show the fixing of the armature to the housing in both views.			

## 2. SEE Important Questions

Cours	se:	CAED					Month	/ Year	May /2	2018
Crs C	ode:	17EE651	Sem:	6	Marks:	80	Time:		180 mi	nutes
	Note	Answer all FIV	E full questio	ns. All quest	ions carry eq	jual marks.		-	-	
Mod	Qno.	Important Que	stion					Marks	СО	Year
ule			1.1						001	
1	1	Develop a dou	uble layer wil	nding for a l	DC machine	having 16 slot	s and 4	30	CO1	2015
		of the bruch	e poles. Drav	v the seque	of induced	omf give or	JUSILION	-		
		connection	5, 510w th		or maaced	enn give ev	qualizei			
	2	Draw the deve	eloped diagra	m of a DC n	nachine with	the following	details	30	CO1	2016
	-	no of poles =4,	, no of slots=2	26 the windi	ng is double	laver lap type	, fix the		001	
		poles draw the	e sequence d	iagram ,fix th	ne position of	polarity of the	e brush			
	3	Design & draw	v the develop	bed double	layer lap wir	nding of DC ar	rmature	30	CO1	2017
		with 24 conduc	ctor and 4 po	les. Also sho	w the directi	on current in t	he coils			
		and brush pos	ition. Draw th	e sequence	diagram.					
	4	Design and di	raw develop	ed winding	diagram of	an AC machi	ne with	30	CO1	2017
		following deta	ills: INO OF PO	les= 4 INO O	T SLOTS= 30 N	NO. OF phase=3	Single			
	E	Design and dr		d 2 phase f	iull nitched A		n for 24	20	$CO_1$	2018
	С	conductor do	uble laver an	oles also sh	iow winding i	in star connect	tion	. 30	COI	2010
					<u>ien mileing</u>					
2	1	Draw a single l	ine diagram (	of a 66KV M	JSS with the	following deta	ails.	20	CO2	2015
		a. 66KV incom	ing lines, 2 no	)S						
		b. Step down t	ransformer 6	2, 6KV/11KV	nos					
		c. OCB's for tra	nsformer bar	nk on L.T side	e – 2 nos					
		d. Duplicate bu	us bars for H.1	and L.T side	e to be provid	ded				
		e. Bus coupler:	s for HI side	only and Thus k						
		r. Feeders, 11 K	v radiating fr	om L.I bus c	bars 4 nos					
		b Position of li	ahtning arres	tors isolator	s CT's and P	T's are to he				
		indicated.	gridning arres	1013, 13014101	5, 01 5 010 1					
	2	Draw the single	e line diagrar	n of a genera	ating station I	having the foll	owing	20	CO2	2017
		details	0	0	0	U	0			
		a. Generators :	50MVA,11KV,	3 <b>Ф</b> Two nos						
		b. Transformer	s: 50MVA, 11/	′132KV, 3 <b>Φ</b> . –	Two nos					
		c. Transformers	s(auxiliary):50	0 KVA , 1100	0/400 V. – 2	nos				
		d. Iransformer	s(reverse):1	MVA , 132/11	KV , 1 no					
		e. Outgoing lin	es: 132 KV, 34	P. 2 NOS CT DT Icolot	ing Switchos	lightning Arro	octore			
		Circuit Breaker	s	51, F1, ISOlal	ing switches	, lightning Are	51015,			
	З	Draw the single	<u>s.</u> e line diagrar	n of a genera	ating station	having the foll	owina	20	CO2	2016
	0	equipment.			9	9	5			
		a. Incoming lin	es : 110 KV , 5	0 Hz. – 2nos						
		b. Outgoing lin	es: 110KV,50	Hz1 no						
		11KV, 50 Hz8	nos							
		c. Iransformers	s: 5MVA,110/:	11KV ,3Φ,	-2nos					
		15MVA, 110/22	:0KV,3Ψ,1r	10						
		One Auxiliary s	tation Transfe	rmers						
	Л	Draw the single	e line diagram	n of a gener	ating station	having the foll	owina	20	$CO_2$	2018
	4	equipment.		n on a genere			S wing		502	
		a. Incoming lin	es: 110 KV, 50	Hz. – 1 no						
		b. Outgoing lin	es: 13.2 KV,50	Hz3 nos						
		11KV, 50 Hz4	nos							
		c. Transformers	s: 15MVA,110/	<b>΄13.2KV</b> ,3 <b>Φ</b> ,	∆⁄ Y1no					
		8 MVA,110/11K	(V,3Φ,Δ/Υ1n	0						
		d. Auxiliary Sta	tion transform	ner : 750 KVA	4 , 11 KV/400	V , Δ/ Y1no				
		e. Bus Bars : 11	U KV1NO							
L										

		1			
		Show the positions of CT, PT, Isolating Switches , Lightning arrestors , Circuit Breakers			
	5	Draw the single line diagram of a substation having the following	20	CO2	2017
	Ū	equipment.			
		a. Incoming lines : 11KV , 50 Hz. – 2 nos			
		b. Outgoing lines : 33 KV , 50 Hz 4 nos			
		c. Transformer: 11/33 KV, 3 $\Psi$ , Y 2 nos d. Rus hars 11/KV/ 1 no			
		a. Dus bais $kv$ , Tho 22 $kV$ 2 nos			
		Show the positions of CT, PT, Isolating Switches, Lightning arrestors,			
		circuit breakers.			
	1	Draw the following views of a $2\Phi$ core type, $250 \frac{1}{10} \frac{1}{10} \frac{1}{100}$	50	<u> </u>	2016
3	T	transformer:	50	003	2010
		a. Front elevation full in section			
		b. Plan in full section			
		Dimensions of various parts are given below:			
		Core: Cross section of the core = 3 stepped core			
		Diameter of the circumscribing circle = 24 cm			
		Distance between adjacent core centers = 42.5 cm			
		Yoke: height of the yoke 25 cm			
		Inner diameter of LV coil = 25 cm			
		Height of LV winding = $435$ cm			
		Number of turns per phase = 12			
		HV Winding: Outer diameter of HV Coil = 41.5 cm			
		Inner Diameter of HV coil = 34.3 cm			
		height of HV winding = 43.5 cm			
		Number of turns / phase = 572			
		Total Height of the transformer = 100 cm			
	2	Draw the front elevation left half in section and sectional plan of a 15 KVA ,	50	CO3	2016
		50 Hz distribution			
		Details of magnetic circuits:			
		Cross section of the core = 63mm×91.6mm			
		window= 298.5mm ×114.5mm			
		Yoke height = 63.5 mm			
		LV winding:			
		Number of coils on each leg = 1			
		Number of turns / coil = 72			
		Number of layers /coil = 3			
		Section of conductor = 2./9mm×10.6mm HV/winding:			
		Number of coils on each leg = 1			
		Number of turns / coil = 720			
		Number of layers /coil = 8			
		Cross Section of wire = 2.59mm dia			
		Insulation details:			
		Air space around the core = 1.66 mm			
		Insulation between core and LT =			
		1.0mm Insulation on H I = 3 mm			
		nsulation at the top and bottom winding and insulation between layer =			
		mm Provide 10 mm bolt with sleeve at suitable spacing			
	3	Draw the longitudinal sectional view of a limb of a single phase	50	COR	2017
	5	transformer with the following details	5-		,
		Diameter of circumscribing circle= 22.6 cm			
		Diameter of LV Winding in 2 layers: inside = 25 cm, outside = 28			
		cm Height of LV winding = 41.2 cm			
		Diameter of HV Winding: inside = 32 cm, outside =36.8			
		cm Height of HV winding = 40 cm			

r						
		4	Draw the detailed drilling of each part of 500 KVA , 6600/400 V, single	50	CO3	2015
			phase power transformer			
			with the following data. Show full assembled plan and elevation			
			Dimension of the core: core construction is			
			cruciform Diameter = 33cm			
			Width of the largest stamping = 33cm			
			Width of the smallest stamping 175			
			cm Height of the core = $43$ cm			
			Contro to contro dictanco between coros - 40 cm			
			Certille to certille distance between cores = 49 cm Cere laminations are used by means of a and platesa mm thick by a			
			Core taminations are used by means of 2 end plates – 3 mm thick by a			
			Doll of dia 1.2			
			icm National and the second s			
			YOKE:			
			Yoke neight = 25cm			
			Yoke length = 77 cm			
			Total height of transformer = 9.3cm			
			Winding:			
			L.V winding:			
			total turns = 22 No of turns / limb = 11			
			Inside dia of LV Winding = 33.75cm			
			Outside dia of LV winding =38.35 cm			
			Total height of the core occupied by the LV winding = 36.2cm			
			H.T winding:			
			2 layers			
			Inside dia of HT 1 st laver			
			= 41.5 cm			
			Outside dia of H.T nd 1 st laver = 43.3 cm			
			Inside dia of HT 2 layer = $45 \text{ cm}$			
			Outside dia of HT 2 nd layer = $46.8$ cm			
ł		E	Draw to a suitable scale the longitudinal cross section of a limb of a $2\Phi$ oil	50	$CO_2$	2015
		5	cooled power	50	003	2013
			transformer showing the HT and LT windings			
			Diamatar of circumscribing iron coro circlo - 22.6 cm			
			Diameter of Cacandan uvinding in 2 concentric layors inside 25 cm			
			Didmeter of Secondary winding in 2 concentric tayers, inside = 25 cm,			
			outside 20.1 CHI, Height			
			Di seconual y winding = 41.2 cm. Diamatar af primar uwinding insida			
			Diameter of primary winding, inside = 32 cm, outside 30.6cm, neight of			
			Primary			
			winding including 10 spacers= 40cm.			
				50		
	4	1	Draw to a suitable scale half sectional end view and longitudinal end view	50	CO3	2016
			of a 60 H.P, 4 Pole DC			
			shunt motor, with the following details:			
			Armature:			
			Outside diameter =18.5 cm			
			Length = 13.5cm			
			Number of slots = 24			
			Size of slot = 0.7cm x 2 cm			
			Main pole (laminated):			
			Total height =11 cm Width = 7cm			
			Pole arc = 10 cm			
			Length of pole =14 cm Air gap =0.5 cm			
			Interpole (solid):Size=2x10.8cm			
			l ength=11cm			
			Commutator:			
			Diameter =13cm			
			l enath =10cm			
			Brush			
ļ			Total no of spindles-4			
ļ			Windina			
			Main nole=2cm thick (Shunt winding)			
- 1						1 I

	Interpole winding = 1 cm thick			
	The armature is directly mounted on the shaft and is held between two			
	and plates. The shaft is supported by means of and shields bearings in			
	end plates. The shall is supported by means of end shields beamings in			
	the end cover			
2	Draw to a suitable scale end view and elevation with top half in section of	50	CO3	2017
	a DC machine, with the			
	following details			
	Voko			
	Outside dispestary 10 Com			
	Outside diameter = 49.0cm			
	inner diameter = 40 cm Axial			
	Length = 16 cm			
	Main pole:			
	Number of poles = 4 Total			
	height = 12.6 cm Width =6cm			
	Air gap = 1.6 mm			
	Number of poles= 4			
	Total height= 11 cm			
	Width =9.5 cm			
	Air gap = 2.5 mm			
2	Following are the details of a main pole of a DC machine. Draw to suitable	50	COn	2016
3	acale	50	003	2010
	a) Elevation with right half in section			
	b) Plan with right half in section			
	Number of poles- 4			
	Height of pole-140mm			
	Width of the pole-127mm			
	Longth of the pole 12/1111			
	Armature diameter-400mm			
	Pole arc/ pole pitch =0.67			
	Number of turns per pole -1890			
	Conductor area -1.77mm 2			
	Depth of the winding-45mm			
	Height of the winding-110mm			
	(Missing data may be propertionally accumed)			
	(Missing data may be proportionally assumed)			
4	Draw the plan and elevation (right-half section) of an inter pole or	50	CO3	2017
	communicating pole used for			
	machine with following dimensions:			
	Height of the pole-130			
	Width of the pole=50			
	Width of the pole=50			
	Width of the pole=50 Length of inter pole=170			
	Width of the pole=50 Length of inter pole=170 No of turns=23			
	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110			
	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3			
	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm			
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions:	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm Diameter of rivet used = 0mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm Diameter of rivet used = 9mm Axial length of pole arc=216mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm Diameter of rivet used = 9mm Axial length of pole arc=216mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm Diameter of rivet used = 9mm Axial length of pole arc=216mm Thickness of yoke=114mm	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm Diameter of rivet used = 9mm Axial length of pole arc=216mm Thickness of yoke=114mm Show the arrangement of fixing pole to yoke.	50	CO3	2018
5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of pole with shoe=228mm Diameter of rivet used = 9mm Axial length of pole arc=216mm Thickness of yoke=114mm Show the arrangement of fixing pole to yoke.	50	CO3	2018
 5	Width of the pole=50 Length of inter pole=170 No of turns=23 Height of winding =110 Area of conductor =50x3 All dimensions are in mm Draw to half scale sectional end elevation and sectional front elevation of a main pole of Dc machine with following dimensions: Width of the pole=168mm Pole arc=240mm Radius of pole arc =336mm Height of pole with shoe=228mm Height of the pole core=192mm Diameter of rivet used = 9mm Axial length of pole arc=216mm Thickness of yoke=114mm Show the arrangement of fixing pole to yoke.	50 50 50	CO3	2018

	the following data – Rotor OD = 225mm Rotor ID = 60mm Pole arc/Pole pitch = 0.74 Pole width = 65mm Damper bars = 5 no. of 10mm diameter. Field winding – 2 stepped in cross section the dimensions are 29mmX10mm and 22mmX8mm Steel rods on each pole body = 44mmX11mm.			
2	Draw to scale half sectional end view and front view of alternator with the following data: Diameter of shaft = 7.6 cm Height of pole = 7.6 cm Diameter of frame (outer) = 92 cm Length of yoke = 22 cm Diameter of rotor = 46 cm outer diameter of the stator = 76 cm Number of poles = 10 Length of stator = 16cm	50	CO3	2017
3	Draw to scale half sectional end view and front view of alternator with the following data: Diameter of shaft = 7.6 cm Height of pole = 7.6 cm Diameter of frame (outer) = 92 cm Length of yoke = 22 cm Diameter of rotor = 46 cm outer diameter of the stator = 76 cm Number of poles = 10 Length of stator = 16cm	50	CO3	2018