Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title:	**TRANSMISION DISTRIBUTION AND UTILISATION**	Course Code	: **15EE52T**
Semester	: **V**	Course Group	: **Core**
Teaching Scheme (L:T:P)	:**4:0:0** (in Hours)	Credits	: **4 Credits**
Type of course	:**Lecture +Assignments**	Total Contact Hours	: **52**
CIE	: **25 Marks**	SEE	: **100 Marks**
Programme: Diploma in Electrical and Electronics Engg.			

Pre-requisites: Knowledge about Basics of Electrical and Electronics Engineering , Electrical circuits, and Electrical power generation.
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Course Objectives :
Explain transmission and distribution systems, analyse the performance of short transmission lines, Understand the need for distribution automation and benefits, study the components and functions of SCADA system, Understand different electric heating and electric welding methods, types of air conditioning systems. Analyse the electric circuits of refrigeration and air conditioner. Design illumination for class rooms, workshops and factories.

COURSE TOPICS:

Unit No	Unit Name	Hours
1	TRANSMISSION SYSTEMS	**10**
2	HVDC, FACTS AND SUB-STATIONS	**08**
3	DISTRIBUTION SYSTEMS	**07**
4	ELECTRIC HEATING AND WELDING	**12**
5	ELECTRO-CHEMICAL PROCESS, REFRIGERATION AND AIR CONDITIONING	**08**
6	ILLUMINATION	**07**
	Total	**52**

Course Outcomes:

On successful completion of the course, the student will be able to:

1. *Explain the basic elements of transmission system, types of transmission system, identify line constants and interpret the performance of short lines.*
2. *Explain basic elements of distribution system, types distribution lines, calculate voltage drop in feeders and explain the functions of load dispatch station.*
3. *Explain HVDC transmission system and its components, understand the objectives of FACTS and distribution automation.*
4. *Explain different types of heating and welding process.*
5. *Explain electro-plating application of electrical energy, different types of air conditioning system and it components.*
6. *Design illumination scheme for class rooms, workshops and factories*

Composition of Educational Components

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's Taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)	Total Marks (Out of 145)
1	Remembering	10	15
2	Understanding	50	70
3	Application/ Analysis	40	60
Total		**100**	**145**

Course Outcome linkage to Cognitive Level

Cognitive Level Legend: R- Remember, U- Understand, A- Application

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Explain the basic elements of transmission system, types of transmission system , identify line constants and interpret the performance of short lines.	***R/U/A***	2, 10	10
CO2	Explain basic elements of distribution system , types distribution lines, calculate voltage drop in feeders and explain the functions of load dispatch station.	***R/U/A***	2, 5,10	08
CO3	Explain HVDC transmission system and its components, understand the objectives of FACTS and distribution automation.	***R/U***	2, 5, 10	07
CO4	Explain different types of heating and welding process.	***U/A***	2,10	12
C05	Explain electro-plating application of electrical energy, identify different types of air conditioning system and it components.	***R/U/A***	2, 10	08
C06	Design illumination scheme for class rooms, workshops and factories	***R/U/A***	2, 5, 6, 10	07
		Total sessions		**52**

Course Content and Blue Print of Marks for SEE:

Unit No	Unit Name	Hour	Max. Marks per Unit	Questions to be set for (5marks) PART - A			Questions to be set for (10marks) PART - B			Marks weightage (%)
				R	U	A	R	U	A	
1	TRANSMISSION SYSTEMS	10	30	1	1	-	0.5	1	0.5	19 %
2	HVDC, FACTS AND SUB-STATIONS	08	20	1	1	-	0.5	0.5	-	15 %
3	DISTRIBUTION SYSTEMS	07	20	1		-	0.5	0.5	0.5	14 %
4	ELECTRIC HEATING AND WELDING	12	35	1	1	-	0.5	1.5	1	23 %
5	ELECTRO-CHEMICAL PROCESS, REFRIGERATION ANDAIR CONDITIONING	08	20	0.5	0.5	-	0.5	0.5	-	15 %
6	ILLUMINATION	07	20		1	-	0.5	0.5	0.5	14 %
	Total	**52**	**145**	**9 (45 Marks)**			**10 (100 Marks)**			**100**

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Transmission Distribution and Utilization	**-**	**3**	**-**	**-**	**2**	**1**	**-**	**-**	**-**	**3**

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Content:

UNIT –I
TRANSMSSION SYSTEMS (10 Hrs)

AC transmission and distribution system – Schematic layout diagram, standard transmission and distribution voltages, Advantages and limitations of High voltage transmission, various systems for power transmission and distribution- 2 wire DC, 2 wire AC, 3 wire AC and 3 phase 4 wire AC systems ,Transmission through overhead and UG system, compare overhead and UG system. Compare HVDC and HVAC system.

OVERHEAD TRANSMISSION LINES: Main components of overhead transmission lines, Classification of transmission lines based on distance, Line constants -resistance, inductance and capacitance. Short transmission line- equivalent circuit, vector diagram, equations for receiving end voltage, efficiency, voltage regulation and power factor - simple problems. Corona- definition, formation, factors affecting corona, advantages and disadvantages, methods to reduce corona. Meaning of skin effect and Ferranti effect. Transposition of conductors.

UNDERGROUND TRANSMISSION LINES: Classification of UG cables, types of cables, general construction of a single core UG cable, construction of 3 core XLPE cables. Essential properties required for insulating material of UG cables. Methods of laying UG cables. Faults in UG cable.

UNIT –II
HVDC, FACTS and SUBSTATIONS (08 Hrs)

HVDC transmission: Block diagram, main components, advantages of HVDC transmission, Limitations of HVDC transmission, Types of HVDC links.

FACTS Controllers- Definition, Objectives, Basic types of FACTS controllers and their functions.

SUBSTATIONS:-Meaning of substation, classification, comparison between outdoor and indoor substation, single line diagram of 220KV/66 KV MUSS, components of substation, Bus bar arrangement- list the types- single bus with and without sectionalisation, double bus bar and ring main system. Importance of interconnecting in large power systems. Function of Load Dispatch Stations.

UNIT –III
DISTRIBUTION SYSTEMS (07 Hrs)

Single line diagram of AC distribution system, Classification of AC distribution system, connection schemes of distribution system- radial, ring main and interconnected systems.

Meaning of Feeder, distributor and service main, characteristics of Feeder, distributor and service main. Concept of voltage drop in feeders/distributors - simple problem on DC distributor fed at one end.

Distribution Automation- Objectives/Need, functions and benefits.

SCADA- Block diagram, components of SCADA and their functions and advantages of SCADA.

UNIT –IV

ELECTRICAL HEATING AND WELDING (12 Hrs)

ELECTRICAL HEATING: Different types of domestic heating appliances, Advantages of electric heating , methods of electrical heating, resistance heating-direct and indirect method, requirement of good heating element, temperature control methods of resistance heating. Arc heating- types- direct and indirect method, Induction heating-types- power frequency, high frequency, high frequency eddy current. Applications of eddy current heating. Di-electric heating- principle and applications. Microwave heating-principle only.

ELECTRIC WELDING: Definition , types- resistance and arc welding , resistance welding list the types-spot welding and seam welding ,Arc welding- list the types, AC arc welding machine, Mention the special type of welding-laser welding.

UNIT –V

ELECTRO CHEMICAL PROCESS, REFRIGERATION AND AIR CONDITIONING (08 Hrs)

ELECTRO CHEMICAL PROCESS- Principles of electro deposition, laws of electrolysis, Electro plating, Factors affecting Electro plating, Factors governing Electro better electro deposition.

REFRIGERATION AND AIR CONDITIONING-
Meaning of refrigeration, types of refrigerants, State properties of refrigerants, vapour compression refrigerator, electric circuit of domestic refrigerator. Necessity of thermostat, defrosting-types of defrosting, need for air conditioning, principle of air conditioning, electrical circuit for air conditioning unit, types of air conditioning system.

UNIT –VI

ILLUMINATION (07 Hrs)

Laws of Illumination, define – solid angle, luminous flux and luminous intensity and illumination,, source of light- types of lamps-florescent lamp, mercury vapour lamp and sodium vapour lamp, lighting schemes- street lighting , flood lighting, direct, indirect ,semi-direct lighting and semi –indirect system . Design of lighting scheme-utilization factor, depreciation factor, space to height ratio- simple problems on design of lighting for class room and auditorium, requirements of good illumination- list the factors.

Reference Books:

1. Transmission, distribution and utilization – vol 3 B.L Thereja and A.K.Theraja.
2. Principles of Power System" by V. K. Mehta, Rohit Mehta S. Chand Publishers, 4th Revised edition 2008
3. Electrical Power Generation Transmission and Distribution by S.N.Singh, PHI Publication
4. Transmission and Distribution of Electric Power by J.B Gupta Katsons Publications.
5. Electric Power Distribution Automation by M.K Khedkar, University Science Press (Laxmi Publications)
6. Power System Operation and Control by Dr.B.R Gupta, S.Chand Publishers.
7. Utilisation of Electric power and electric traction by G. C. Garg, Khanna Publishers, New Delhi.
8. Utilisation of Electrical Power by R K Rajput, Laxmi Publications Pvt. Ltd, New Delhi.

e-Resources:

1. Magazines-ABB Review-u Pictures of the Future by Siemens
2. www.abb.com/review,www.siemens.com/pof
3. www.newnespress.com
4. www.youtube.com/
5. https://en.wikipedia.org/wiki/
6. *www.schenieder.com*

Course Delivery:

The Course will be delivered through lectures, classroom interaction, animations, group discussion, exercises and student activities, assignments.

Course Assessment and Evaluation:

	What		To Whom	Frequency	Max Marks	Evidence Collected	Course Outcomes
Direct Assessment	CIE (Continuous Internal Evaluation)	I A Tests	Students	Three IA tests for Theory: (Average marks of Three Tests to be computed).	20	Blue Books	1 to 6
		Student Activity		Student Activity	05	Report of 2 pages	1 to 6
				TOTAL	**25**		
	SEE (Semester End Examination)	End Exam	Students	End Of the Course	100	Answer Scripts at BTE	1 to 6
Indirect Assessment	Student Feedback on course		Students	Middle Of The Course	Feed Back Forms		1 to 6
	End Of Course Survey			End Of The Course	Questionnaires		1 to 6

***CIE** – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier*: *The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks evaluated through appropriate rubrics.
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Course Contents with Lecture Schedule:

Lesson No./ Session No.	Contents	Duration
Unit I	TRANSMISSION SYSTEM	10Hrs
1.	Explain AC transmission and distribution system with typical single line diagram, mention standard transmission and distribution voltages. List the advantages and limitations of transmission at high voltage.	01 Hour
2.	Various systems for power transmission and distribution- 2 wire DC, Single phase 2 wire AC, 3 wire AC and 3 phase 4 wire AC systems and their applications.	01 Hour
3.	Explain transmission through overhead transmission lines.Main components of overhead transmission lines.Explain the steps involved in erection of transmission tower.	01 Hour
4.	Explain transmission through UG transmission system, compare overhead and UG system. Compare HVDC and HVAC system	01 Hour
5.	Classification of UG cables, Essential properties of insulating material used in for UG cables, list the types UG cables based on construction. Explain with diagram the general construction of a single core UG cable.	01 Hour
6.	Explain with diagram the construction of 3 core XLPE cable. List and explain the methods of laying UG cable, mention their merits and de-merits. List the faults in UG cables.	01 Hour
7.	Classification of transmission lines based on distance, explain line constants - resistance, inductance and capacitance. Short transmission line- equivalent circuit, vector diagram, write the equations for receiving end voltage, efficiency, voltage regulation and power factor.	01 Hour
8.	Simple problems on performance of short transmission lines.	01 Hour
9.	Explain Corona, formation of corona, factors affecting corona, advantages and disadvantages, methods to reduce corona.	01 Hour
10.	Meaning of skin effect and Ferranti effect. Explain transposition of conductors with diagram	01 Hour

Unit II	HVDC, FACTS and SUBSTATIONS	08 Hrs
11.	HVDC transmission lines-block diagram, list and explain the functions of main components of HVDC transmission system.	01 Hour
12.	Types of HVDC links –monopolar, bipolar and Homo-polar DC link. Advantages of HVDC transmission, Limitations of HVDC transmission.	01 Hour
13.	FACTS Controllers- Definition, Objectives, Basic types of FACTS controllers and their functions.	01 Hour
14.	Meaning of substation and receiving station and their functions, Classification of substations, Comparison between outdoor and indoor substation.	01 Hour
15.	Draw single line diagram of 220KV/66 KV MUSS. List the main components of substation and mention their functions.	01 Hour
16.	Bus bar arrangement- list the types- explain with diagram single bus arrangement with and without sectionalisation,	01 Hour
17.	Explain with diagram double bus double breaker and ring main bus bar arrangements.	01 Hour
18.	Explain the importance of interconnecting substations in large power systems. Functions of Load Dispatch Stations.	01 Hour
Unit III	**DISTRIBUTION SYSTEM**	**07Hrs**
19.	Classification of distribution system. Explain with diagram AC distribution system.	01 Hour
20.	List and explain the connection schemes of distribution system- radial, ring main and interconnected systems.	01 Hour
21.	Distinguish between Feeder, distributor and service main. List the characteristics of Feeder, distributor and service main.	01 Hour
22.	Concept of voltage drop in feeders/distributors	01 Hour
23.	Solve simple problems on DC distributor fed at one end.	01 Hour

24.	Distribution Automation– List the objectives/Need , functions and benefits.	01 Hour
25.	SCADA- Block diagram, components of SCADA and their functions .Advantages and dis-advantages of SCADA.	01 Hour
Unit IV	**ELECTRIC HEATING AND WELDING**	**12 Hrs**
26.	List the domestic and industrial applications of electric heating and the advantages of electric heating. Differentiate the methods of heat transfer- conduction, convection and radiation.	01 Hour
27.	Classification of electrical heating. Explain with diagram direct and indirect methods of resistance heating. Mention their applications.	01 Hour
28.	Requirement of good heating element. List and explain temperature control methods of resistance furnace with diagrams.	01 Hour
29.	Explain with diagram direct and indirect arc furnace. Mention their application. Ref:1 , page no. 1843. Fig. 47.11	01 Hour
30.	Induction heating-types- explain with diagram core type induction furnace. List the advantages and disadvantages. Mention the applications.Ref:1 page no. 1846	01 Hour
31.	Explain with diagram coreless type induction furnace. List the advantages and disadvantages. Mention the applications. Ref:1 page no. 1849	01 Hour
32.	Explain with diagram high frequency eddy current heating. List the advantages and applications of eddy current heating.	01 Hour
33.	Di-electric heating- Explain the principle, list the advantages. Mention the applications of dielectric heating.	01 Hour
34.	Explain the principle (**only**) of microwave heating.	01 Hour
35.	Define welding. List the types of electric welding. Resistance welding- types- explain with diagram spot welding and seam welding. Mention their applications.	01 Hour
36.	Explain with diagram AC arc welding machine (welding transformer). Mention the advantages and dis-advantages.	01 Hour

	Ref :1 page no. 1871, fig. 48.14	
37.	Special type of welding – Explain laser welding with diagram. Mention the applications. List the advantages of laser welding.	01 Hour
Unit V	**ELECTRO-CHEMICAL PROCESS, REFRIGERATION AND AIR CONDITIONING**	**08 Hrs**
38.	Meaning of electro plating, Explain principle of electro deposition, State faradays laws of electrolysis.	01 Hour
39.	List and explain the factors affecting the amount of electro deposition. List and explain the factors governing better electro deposition. Mention the applications of electroplating.	01 Hour
40.	Define refrigeration. List the types of refrigerants. State properties of refrigerants.	01 Hour
41.	Explain with diagram the working of vapour compression refrigerator.	01 Hour
42.	Explain the electric circuit of domestic refrigerator. Explain the necessity of thermostat. Explain the working of thermostat**.**	01 Hour
43.	Define defrosting. List and explain the types of defrosting.	01 Hour
44.	Explain- air conditioning, need for air conditioning and principle of air conditioning. Explain with neat sketch window type of air conditioning system	01 Hour
45.	Explain with neat sketch split type of air conditioning system. Explain with neat sketch centralized air conditioning system.	01 Hour
Unit VI	**ILLUMINATION**	**07 Hrs**
46.	Define – plane angle, solid angle, luminous flux and luminous intensity, illumination, reflection factor and lamp efficiency. Explain utilization factor (co-efficient of utilization), space to height ratio and depreciation factor.	01 Hour
47.	State and explain the Laws of Illumination- Inverse square law and cosine law. List the requirements/ factors affecting of good lighting. List the source of light and types of lamps.	01 Hour
48.	Explain the construction and working of High pressure mercury vapour lamp.	01 Hour

49.	Explain the construction and working of High pressure sodium vapour lamp.	01 hour
50.	Explain the lighting schemes-direct, indirect, semi-direct lighting, semi –indirect system and flood lighting.	01 Hour
51.	Design illumination for a class room. Ref:1 page no.1922	01 Hour
52.	Design illumination for a workshop. Ref:1 page no.1921	01 Hour

Student Activity (any one to be submitted with 3 pages self HAND WRITTEN report):

1. Visit nearby transmission system ,identify the different parts and submit a report.
2. Prepare a report on new technologies used in OH lines and UG cables.
3. Prepare a report on latest trends in power transmission.
4. Prepare a report on VSC-HVDC power transmission.
5. Prepare a report on SCADA vs Distribution automation.
6. Prepare a report on Smart Grid distribution system.
7. Prepare a report on latest trends in electrical heating.
8. Prepare a report on latest trends in Welding technology.
9. Prepare a report on latest trends in Refrigeration and Air conditioning.
10. Prepare a report on latest trends in Electro plating.
11. Prepare a report on latest trends in Illumination technologies.
12. Visit nearby substation and submit a report.

MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY (Course Coordinator)

Dimension	Scale					Students score (Group of five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	3				
2	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2				
3	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	5				
4	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks **One activity on any one CO (course outcome) may be given to a group of FIVE students** **Grand Average/Total**						14/4 =3.5 ≈4				

Example only: MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY-
Task given- Industrial visit and report writing

Dimension	Scale					Students score (Five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1.Organisation	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed	3				
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles	2				
3.Conclusion	Poor	Less Effective	Partially effective	Summarises but not exact.	Most Effective	5				
4.Convensions	Frequent Error	More Error	Some Error	Occasional Error	No Error	4				
					Total marks	14/4=3.5 ≈4				

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th week of sem 10-11 Am			20
	Year:		
Name of Course coordinator : Units:__ CO's:____			

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal Choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
1st Test/ 6 th week, DD/MM/YY 10-11 AM	V SEM, E & E Engg	**Transmission Distribution and Utilisation**	20
	Year: 2015-16	Course code: 15EE52T	

Name of Course coordinator :
Units Covered :1 and 2
Course Outcomes : 1 and 2
Instruction :*(1). Answer all questions (2). Each question carries five marks*

Question No.	Question	CL	CO	PO
1	Explain AC transmission and distribution system with a single line diagram.	R	1	2, 10
2	Explain voltage regulation and transmission line efficiency.	U	1	2, 10
3	Distinguish between Feeder, distributor and service main.	U	2	2, 10
4	Explain voltage drop in feeders.	A	2	2, 10

CL: Cognitive Level, R-Remember, U-Understand, A-Application, PO: Program Outcomes

Model QUESTION Paper BANK:

Course Title: **TRANSMISION DISTRIBUTION AND UTILISATION**	Course Code: 15EE52T

Unit 1 –TRANSMISSION SYSTEM

Cognitive Level: REMEMBER, UNDERSTAND

1) Explain the typical ac power supply scheme (single line diagram of typical ac power supply scheme)
2) Compare DC and AC power transmission.
3) List the advantages and limitations of High transmission voltage.
4) Classify the various types of for power transmission system.
5) Explain briefly the different elements of transmission line.
6) Explain voltage regulationand efficiency.
7) List the standard voltages used for Transmission systems.
8) Explain briefly the main components of overhead lines.
9) Explain briefly desirable properties of Insulators.
10) Define Corona and its formation.
11) List the factors affecting corona.
12) List the advantages and disadvantages of Corona.
13) List the methods to reduce corona.
14) Explain briefly Constants of a transmission line.
15) Explain voltage regulation and transmission efficiency
16) Explain Short transmission lines with vector diagram.
17) Explain Skin effect and Ferranti effects.
18) Classify the UG cables based on construction.
19) Explain requirements of insulating materials used in UG cables.
20) Explain construction of a 3 core UG cable.
21) Classify the UG cables based on voltage.
22) Explain with diagram the construction of XLPE cable.
23) List the types of cable faults

Unit 2 –HVDC, FACTS AND SUBSTATIONS

Cognitive Level: UNDERSTAND, APPLICATION

24) Briefly explain the principle of HVDC system operation with sketch.
25) List the advantages and limitations of HVDC transmission.
26) Compare HVAC and HVDC transmission.
27) Briefly explain types of DC links with diagrams.
28) Explain Monopolar DC link with diagram.
29) Explain Bipolar DC link with diagram.
30) Explain Homopolar DC link with diagram.
31) Briefly explain Flexible AC Transmission systems (FACTS).
32) State objectives of FACTS.
33) Name the different types of FACTS controllers with functions.
34) Explain the functions of Substation.
35) Classify the substations.
36) Compare outdoor and indoor substations.

Unit 3–DISTRIBUTION SYSTEM

Cognitive Level: UNDERSTAND, APPLICATION

37) Explain the single line diagram of low tension distribution system.
38) Explain the different classes of distribution systems.
39) Explain with sketch the AC Primary distribution system.
40) Draw the AC Secondary distribution system.
41) Explain the AC Secondary distribution system.
42) Explain the different forms of DC distribution system.
43) Explain the 2 wire dc system.
44) Explain the 3 wire dc system.
45) Compare overhead versus underground system.
46) Explain briefly the different connection schemes of distribution system.
47) Explain with sketch Radial distribution system.
48) Explain with sketch Ring main distribution system.
49) Explain with sketch Interconnected distribution system.
50) Explain briefly the requirements of a distribution system.

51) Explain the design considerations in distribution system.
52) State the need for Distribution automation.
53) List the characteristics of Distribution automation.
54) List the functions of Distribution automation.
55) List the benefits of Distribution automation.
56) Explain the block diagram of SCADA.
57) List the advantages of SCADA.
58) List the functions of SCADA.

Unit 4 - ELECTRICAL HEATING AND WELDING

Cognitive Level: UNDERSTAND, APPLICATION

59) List the domestic and industrial applications of electric heating.
60) Explain the modes of heat transfer in brief.
61) Classify different methods of Electric heating
62) Explain with sketch Direct resistance heating
63) Explain with sketch Indirect resistance heating
64) List the materials used for heating element
65) Explain the material requirements for making heating elements.
66) Explain the causes for failure of heating elements
67) Explain the different methods of temperature control with diagrams.
68) List the types of arc furnaces.
69) Explain with sketch Direct Arc furnace.
70) Explain with sketch indirect Arc furnace
71) List the types of induction furnaces
72) Explain induction heating.
73) Explain core less induction furnaces.
74) Explain core type induction furnaces.
75) List the applications induction furnaces
76) Explain microwave heating.
77) List the advantages of microwave heating.
78) List the application of microwave heating

Unit 5 -ELECTRO CHEMICAL PROCESS REFRIGERATION AND AIR CONDITIONING.

Cognitive Level: REMEMBER, UNDERSTAND, APPLICATION

79) Explain refrigeration.
80) List the types of refrigerants.
81) State properties of refrigerants
82) Describe the working system of vapour compression refrigerator
83) Explain the electric circuit of domestic refrigerator.
84) Explain the necessity of thermostat.
85) Explain the working of thermostat.
86) Explain defrosting.
87) List the types of defrosting.
88) Explain different types of defrosting.
89) Explain the need of air conditioning.
90) Explain the principle of air conditioning
91) Draw the associated electrical circuit for air conditioning unit and explain its working
92) Explain with neat sketch window type of air conditioning system
93) Explain with neat sketch split AC system
94) Explain with neat sketch centralized AC system
95) Explain the term welding.
96) Mention the different types of welding
97) Explain the different methods of electric resistance welding and list their applications.
98) Explain the principle of electric ARC welding
99) Explain welding transformer with reactance coil.
100) List the types of electric arc welding.
101) Explain the meaning of electro plating
102) Mention the necessity of electro plating
103) Explain principle of electro deposition.
104) Mention the applications of electroplating and explain in brief.
105) State faradays laws of electrolysis.

106) Explain the following factors affecting the amount of electro deposition a) Time b) Efficiency c) Current d) Strength of solution

107) Explain the following factors governing better of electro deposition a) Electrolytic concentration b) Temperature c)) Strength of solution d) Addition of agents e) Nature of electrolyte f) nature of the metal upon which deposition is to be made g) throwing power.

108) Define a) Flux b) Solid angle c) Luminous intensity d) illumination e) Depreciation factor f) Reflection factor g) Coefficient of utilization h) space height ratio.

Unit VI- ILLUMINATION

Cognitive Level: REMEMBER, UNDERSTAND, APPLICATION

109) Define a) Flux b) Solid angle c) Luminous intensity d) illumination e) Depreciation factor f) Reflection factor g) Coefficient of utilization h) space height ratio

110) State and explain the laws of illumination a) Inverse square law b) cosine law

111) Design lighting scheme for workshop- problem.

112) Design lighting scheme for class room- problem.

113) Design lighting scheme for factory- problem.

114) Explain the construction and working of Sodium Vapour Lamp

115) Explain the construction and working of Mercury vapour lamp

116) Explain the requirements of good lighting.

Model Question Paper: Code: 15EE52T

TRANSMISION DISTRIBUTION AND UTILISATION

V Semester Examination

Diploma in Electrical and Electronics Engg.

Time: 3 Hours

Max Marks: 100

***Note*:** i) Answer any SIX questions from PART - A. Each question caries 5 marks.

ii) Answer any SEVEN Questions from PART - B. Each question caries 10 marks.

PART – A

1) Classify the various systems for power transmission.
2) State the standard voltages used for transmission and distribution.
3) Classify the UG cables based on voltage.
4) List the components of HVDC transmission system.
5) Explain the different types of AC distribution system.
6) List the functions of Distribution automation.
7) List the advantages of Direct Arc furnace.
8) List the advantages of high frequency core less induction furnaces
9) Explain welding transformer with reactance coil.

PART – B

10)	(a)	Explain long transmission line with simple diagram	(6 M)
	(b)	Briefly explain line constants.	(4 M)
11)	(a)	Explain with diagram the construction of 3 corer UG cable.	(6 M)
	(b)	List the types of cable faults	(4 M)
12)	(a)	Briefly explain the operation of HVDC with a block diagram	(6 M)
	(b)	List the objectives of FACTS.	(4 M)
13)	(a)	Explain the AC Secondary distribution system.	(6 M)
	(b)	State the need for Distribution automation.	(4 M)
14)	(a)	Explain SCADA with block diagram.	(6 M)
	(b)	Classify different methods of Electric heating	(4 M)

15)	(a)	List the types of induction furnaces	(4 M)
	(b)	Explain microwave heating.	(6 M)
16)	(a)	List the properties of refrigerants.	(4 M)
	(b)	Explain diagram with electrical circuit of air conditioning unit..	(6 M)
17)	(a)	Explain with diagram the working of vapour compression refrigerator.	(6 M)
	(b)	Mention the necessity of electro plating	(4 M)
18)	(a)	State and explain the laws of illumination	(6 M)
	(b)	List the types of electric arc welding.	(4 M)
19)	(a)	Explain indirect lighting scheme with a neat sketch.	(4M)
	(b)	Design the lighting scheme for a class room (problem to be given)	(6 M)

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