

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

Course Title : <b>Electrical Power Generation</b>	Course Code : 15EE32T
Semester : <b>III</b>	Course Group : <b>Core</b>
Teaching Scheme in Hrs (L:T:P) : <b>4:0:0</b>	Credits : <b>4 Credits</b>
Type of course : <b>Lecture + Assignments</b>	Total Contact Hours : <b>52</b>
CIE : <b>25 Marks</b>	SEE : <b>100 Marks</b>

**Pre-requisites:** Elements of Electrical Engineering , Electrical Circuit Theory & Electrical machines -I

**Course Objectives** : To understand various sources of energy, construction and operation of conventional and non-conventional power plants. Impacts of power generation on environment, power factor improvement and power plant economics.

**COURSE TOPICS:**

Unit No	Unit Name	Hours
1	Hydroelectric and thermal power plants	9
2	Nuclear power plant, Diesel power plant and Gas turbine power plant.	6
3	Solar photovoltaic system	7
4	Wind Power plant	8
5	Tidal Power Plant , Wave energy , Ocean thermal energy and Biomass Power Plant	11
6	Fuel Cells, Hybrid power plant and Power factor improvement.	11
	<b>Total</b>	<b>52</b>

## Course Outcomes:

*On successful completion of the course, the students will be able to attain CO:*

1. Understand the importance of Generation, types, layouts, Advantages and Disadvantages.
2. Explain in detail Nuclear power plant, Diesel and Gas turbine plant.
3. Explain Solar PV system, types, environmental impacts, and solar cells. Know advantages and disadvantages.
4. Explain Wind energy and wind turbines, wind types, site selection, and environment impacts.
5. Differentiate Tidal power, Wave energy, Ocean thermal energy, urban waste to energy, and Bio mass power plants. .
6. Understand and analyse Hybrid PV system, and Power factor improvements.

## 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	7	10
2	Understanding	51	75
3	Application/ Analysis	42	60
<b>Total</b>		<b>100</b>	<b>145</b>

## Course Outcome linkage to Cognitive Level

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

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand the importance of Generation, types, layouts, Advantages and Disadvantages.	<i>R/U</i>	2,5, 6, 10	09
CO2	Explain in detail Nuclear power plant, Diesel and Gas turbine plant.	<i>U/A</i>	2,5, 6, 7	06
CO3	Explain Solar PV system, types, environmental impacts, and solar cells. Know advantages and disadvantages.	<i>U/A</i>	2,5, 6, 10	07
CO4	Explain Wind energy and wind turbines, wind types, site selection, and environment impacts.	<i>U/A</i>	2,5, 6, 10	08
CO5	Differentiate Tidal power, Wave energy, Ocean thermal energy, urban waste to energy, and Bio mass power plants. .	<i>U/A</i>	2,5, 6, 10	11
CO6	Understand and analyse Hybrid PV system, and Power factor improvements.	<i>U/A</i>	2, 4, 5, 6, 10	11
		<b>Total sessions</b>		<b>52</b>

## 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	Hydroelectric and thermal power plants	09	25	1	1		0.5	1		17
2	Nuclear power plant, Diesel power plant and Gas turbine power plant.	06	15		1				1	10
3	Solar photovoltaic system	07	20		1		0.5	1		14
4	Wind Power plant	08	25		1			1	1	17
5	Tidal Power Plant , Wave energy , Ocean thermal energy and Biomass Power Plant	11	30		1	1		1	1	21
6	Fuel Cells, Hybrid power plant and Power factor improvement.	11	30		1	1		1	1	21
	<b>Total</b>	<b>52</b>	<b>145</b>	<b>9 (45 Marks)</b>			<b>10 (100 Marks)</b>			<b>100</b>

## Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Electrical Power Generation	-	3	-	1	3	3	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  $\geq 40\%$  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-1

09hrs

#### **Hydroelectric power plants.**

**Introduction-**Importance of electrical power generation. Sources of energy available in nature. List Conventional and non-conventional sources. List the factors to be considered for selection of site. Classify hydroelectric power plants based on the available head of water, plant capacity, load and construction. Draw the general layout of hydro power plant. List the main components of hydro electric power plant. Briefly explain the main components – catchment area, reservoir, forebay, dam, spillway, trash rack, surge tank, penstock, prime mover, alternator, and draft tube and tail race. Explain the meaning of water hammer and its effect. Environmental Impact of Hydrol power plant.

#### **Thermal power plant.**

List the factors to be considered for selection of site. Draw the General layout of thermal (steam) power plant. Explain the working of thermal power plant. Compare thermal power plant with hydroelectric power plant. Advantages and disadvantages of Thermal power plant. Environmental Impact of Thermal power plants such as Air pollution and stack emissions, Sulphur- dioxide impacts, Nitrogen oxide impacts, Air borne particulates impacts and cooling tower.

### Unit-2

#### **Nuclear power plant.**

06hrs

List the factors to be considered for selection of site. Draw the schematic diagram explain the working of Nuclear power plant. Compare thermal power plant with nuclear power plant. Explain Nuclear power plant impacts such as Health physics, nuclear wastes and nuclear waste disposal List. Comparison between thermal power plant with nuclear power plant. List the applications of Nuclear power plant.

#### **Diesel power plant.**

Draw the schematic diagram of a Diesel generator unit and explain the main components. List the Advantages and Disadvantages of Diesel power plant.

#### **Gas turbine power plant.**

Draw the schematic diagram of a Gas turbine power plant and explain the same. List the Advantages and Disadvantages of Gas turbine power plant.

### Unit-3

#### **Solar photovoltaic system**

07hrs

Explain Photovoltaic effect solar cell, solar power. Explain Construction of solar cell. Explain with block diagram solar photovoltaic module. Explain with block diagram Construction of photovoltaic panel and PV array. Explain the Materials used in solar cells. List Classification of solar photovoltaic systems. Explain with block diagram the stand-alone and grid interactive solar PV system. List the Advantages and dis-advantages of PV systems and explain environmental impacts of solar PV system.

## Unit-4

### Wind Energy.

08hrs

Explain the importance of Wind Energy. Explain the origin of Global and local winds. List the factors to be considered for site selection. Factors affecting distribution of wind energy on surface of the earth. Explain Nature of winds. Explain with neat sketch Construction of horizontal axis wind turbine generator with diagram. Explain with neat sketch Construction of vertical axis wind turbine generator with diagram. Comparison between horizontal axis and vertical axis wind turbine generator. Explain Environmental Impact of wind.

## Unit-5

### Tidal power plant -

11hrs

List the factors to be considered for site selection. Explain Origin and nature of Tidal Energy. Classify the types of Tidal power plant. Explain with diagram single basin and double basin type tidal power plant. List the merits and demerits.

### Wave energy-

Introduction, list classification wave energy devices. List Advantages and Dis-advantages of wave energy. Explain the construction and working of Heaving float type, pitching type and Heaving and pitching type wave Devices.

### Ocean thermal energy-

Working principle of ocean thermal energy conversion. Explain with block diagram the open and closed cycle OTEC plants. List advantages and dis- advantages.

### Urban waste to energy conversion-

Explain with block diagram municipal solid waste to energy incineration plant.

### Biomass power plant-

Explain the importance of biomass energy and its scope. List the factors to be considered for site selection. Draw and explain the line diagram of biomass power plant. List the types of biogas plants. Briefly explain batch type, continuous type, and movable drum type and fixed dome types. Explain with diagram movable drum type biogas plant. Explain with diagram fixed dome type biogas plant. Compare movable and fixed dome types. List the merits and demerits biomass power plant.

## Unit-6

11hrs

### Fuel cells

Define fuel cell. Classification of fuel cells. Explain with diagram the working principle and operation of phosphoric acid fuel cell (PAFC), alkaline fuel cell (AFC) and polymer Electrolyte Membrane fuel cell (PEMFC). Explain the performance limiting factors of fuel cell. Losses of fuel cells. List Advantages of fuel cells, List the applications fuel cell. Explain the environmental Impact of fuel cells.

## Hybrid power plant-

**Hybrid PV systems-** Types of hybrid PV systems. Explain with block diagram PV-Diesel hybrid system, PV-Wind hybrid system and, PV-fuel cell hybrid system. (Reference-Solar Photovoltaics. Fundamental, Technologies and Applications, By Chetan Singh Solanki, Third Edition-2015, PHI PVT, Delhi-110092. Page NOs 440-443)

## Power factor improvement-

Explain the meaning of power factor and its significance. State the causes of low power factor. Explain the effects of low power factor on power plant. List the methods of power factor improvement. Selection of capacitor bank to improve power factor.

## Reference Books-

1. Non-conventional Energy Resources - **G.S.Sawhney**, PHI publications, second Printing-2014, Delhi-110092.
2. Non-conventional Energy Resources-**B.H.Khan** 2<sup>nd</sup> Edition Tata McGraw hill PVT, New-Delhi.
3. Principles of power system by **V.K.Mehta and Rohit Mehta** S.CHAND
4. Solar photovoltaic Technology and systems, - **Chetan Singh Solanki**, PHI, Delhi-110092.
5. Generation of Electrical Energy, by **B.R.Gupta**, publisher S.chand & company LTD, New Delhi
6. Solar Photovoltaics. Fundamental, Technologies and Applications, - **Chetan Singh Solanki**, Third Edition-2015, PHI PVT, Delhi-110092
7. Elements of power station design-**M V Deshpande**-PHI Publications
8. Electrical Power Generation, Transmission and Distribution. - **S.N.Singh**. PHI Publications.
9. Power Plant Engineering - **K.K.Ramalingam** SCITECH
10. Power Plant Engineering - **A. K. Raja**, New Age International Publisher
11. Generation Distribution and Utilisation of electric energy by **C.L. Wadwa**, -New-Age International Publisher
12. Substation design and equipments-**P.S Satna**-Dhanpatrai.

## E-resources:

1. [https://en.wikipedia.org/wiki/Electricity\\_generation](https://en.wikipedia.org/wiki/Electricity_generation).
2. <https://www.google.com/phindia.com//solarphotovoltaics>.
3. <https://www.schandgroup.com>.
4. <https://www.tatamcgrawhill.com>

## Suggested Student activities-

Each student has to submit at least 3 pages of self hand written report covering any one of the following topics. Each student is expected to carry out a study on any one by visiting respective plants.

**Exercise 1-** Design calculations for establishing a Solar panel/ system for a lighting purpose using Inverter, battery, etc,

**Exercise 2-** Improve power factor of given 3-phase IM using appropriate capacitor Bank (For different power factors).

**Exercise 3-** Visit to solar PV plant and windmill and bio-gas plants.

**Exercise 4-** Visit to hydroelectric power plant, thermal power plants and D.G. power plant.

**Exercise 5-** Green energy, advantages, and classification, etc.

**Exercise 6 -** Design and establish solar operated application to 1) pump 2) Street lamp 3) fan 4) traffic signal control. 4) Rural electrification 5) Rooftop lighting

### 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				
<p><b>Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks</b></p> <p><b>One activity on any one CO (course outcome) may be given to a group of FIVE students</b></p> <p style="text-align: right;"><b>Grand Average/Total</b></p>						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. Conventions	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 <sup>th</sup> week of sem 10-11 Am	I/II SEM		20			
	Year:					
Name of Course coordinator : CO's: _____			Units: __			
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		
1 <sup>st</sup> Test/ 6 <sup>th</sup> week, 9 Feb 16, 10-11 AM	III SEM, E & E Engg	<b>Electrical Power Generation</b>	20		
	Year: 2015-16	Course code:			
Name of Course coordinator : Units Covered : 1 and 2 Course Outcomes : 1 and 2 <p style="text-align: center;"><b>Instruction :</b> (1). Answer all questions (2). Each question carries five marks</p>					
Question No.	Question		CL	CO	PO
1	List the Factors to be considered for selection of site.		R	1	2,5, 6, 10
2	With neat sketch explain the general layout hydro electric power plant.  OR  Compare thermal power plant with hydroelectric power plant.		R  U	1	2,5, 6, 10
3	With neat sketch explain construction and working of Diesel power plant  OR  List the applications of Diesel power plant.		U  U	2	2,5, 6, 7
4	Explain Nuclear power plant impacts such as Health physics, nuclear wastes and nuclear Waste disposal List.		A	2	2,5, 6, 7

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

## Course Delivery:

The course will be delivered through lectures, class room interaction, animation, group discussion exercises & 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
		Classroom Assignments		Student Activities	05	Hand written report	1 to 6
		<b>TOTAL</b>		<b>25</b>			
	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.

## Course Contents with Lecture Schedule:

Lesson No./ Session No.	Contents	Duration
<b>Unit-I</b>	<b>Hydroelectric and Thermal power plants</b>	<b>09 hrs</b>
1	<b>Introduction</b> -Importance of electrical power generation. Sources of energy available in nature. List Conventional and non-conventional sources.	1hr
2	<b>Hydro power plant</b> -Factors to be considered for selection of site and Classify hydroelectric power plants based on the available head of water, plant capacity, load and construction.	1hr
3	General layout of hydro power plant and explain of its components. Meaning of water hammer and its effect.	1hr
4	Advantages and Disadvantages of Hydroelectric power plant.	1hr
5	Environmental Impact of Hydel power plant	1hr
6	<b>Thermal power plant</b> - Factors to be considered for selection of site. General layout of thermal (steam) power plant.	1hr
7	Working of thermal power plant. Compare thermal power plant with hydroelectric power plant.	1hr
8	Advantages and disadvantages of Thermal power plant.	1hr
9	Environmental Impact of Thermal power plants such as Air pollution and stack emissions, Sulphur- dioxide impacts, Nitrogen oxide impacts, Air borne particulates impacts and cooling tower.	1hr
<b>Unit--II</b>	<b>Nuclear, Diesel and Gas turbine power plants</b>	<b>06hrs</b>
10	<b>Nuclear power plant</b> -Factors to be considered for selection of site and Schematic diagram of nuclear power plant.	1hr
11	Construction and working of Nuclear power plant.	1hr
12	Nuclear power plant impacts such as Health physics, nuclear wastes and nuclear waste disposal. Comparison between thermal power plant with nuclear power plant.	1hr
13	<b>Diesel power plant</b> -Schematic diagram of a Diesel generator unit and explain of main components.	1hr
14	<b>Gas turbine power plant</b> - Schematic diagram of a Gas turbine power plant and explain the same.	1hr
15	Advantages and Disadvantages of Diesel power plant and Gas turbine power plant.	1hr
<b>Unit-III</b>	<b>Solar photovoltaic system</b>	<b>07 hrs</b>
16	Photovoltaic effect, solar power.	1hr

Lesson No./ Session No.	Contents	Duration
17	Construction of solar cell, solar photovoltaic module with block diagrams.	1hr
18	Construction of photovoltaic panel and PV array with block diagrams.	1hr
19	Materials used in solar cells and Solar cells Applications.	1hr
20	Classification and Scheme of solar photovoltaic systems.	1hr
21	Explanation of stand-alone and grid interactive solar PV system with block diagram	1hr
22	Advantages and dis-advantages of PV systems and environmental impacts of solar PV system on environment.	1hr
<b>Unit-IV</b>	<b>Wind Power plant</b>	<b>08 hrs</b>
23	Importance of Wind Energy. Explain the origin of Global and local winds.	1hr
24	Factors affecting distribution of wind energy on surface of the earth.	1hr
25	Explain Nature of winds with neat sketches.	1hr
26	List the factors to be considered for site selection.	1hr
27	Construction of horizontal axis wind turbine generator with neat diagram.	1hr
28	Construction of vertical wind turbine generator with neat diagram	1hr
29	Comparison between horizontal axis and vertical axis wind turbine generator.	1hr
30	Explain Environmental Impact of wind plants.	1hr
<b>Unit-V</b>	<b>Tidal Power Plant, Wave Energy and Ocean thermal Energy, Biomass Power.</b>	<b>11 hrs</b>
31	<b>Tidal power plant</b> -Factors to be considered for site selection. Explain Origin and nature of Tidal Energy. Classify the types of Tidal power plant.	1hr
32	Explain with diagram single basin and double basin type tidal power plant. List the Advantages and Dis-advantages.	1hr
33	<b>Wave energy</b> -Introduction. Explain the construction and working of Heaving float type(air pump),	1hr
34	Pitching type and Heaving and pitching type wave Devices Advantages and Dis-advantages of wave energy.	1hr
35	<b>Ocean thermal energy</b> -introduction, Explain with block diagram the open OTEC plants.	1hr
36	Explain with block diagram the closed cycle OTEC plants. List advantages and dis- advantages.	1hr

Lesson No./ Session No.	Contents	Duration
37	<b>Urban waste to energy conversion-</b> Explain with block diagram municipal solid waste (MSW) to energy incineration plant.	1hr
38	<b>Biomass power plant-</b> Importance of biomass energy and its scope. Factors to be considered for site selection. Draw and explain the line diagram of biomass power plant.	1hr
39	List the types of biogas plants. Explain different types of biogas plant.	1hr
40	Construction and working of floating drum type biogas plant with diagram. Advantage and disadvantages of floating drum type biogas plant	1hr
41	Construction and working of fixed dome type biogas plant with diagram. Advantage and disadvantages of Fixed drum type biogas plant	1hr
<b>Unit-VI</b>	<b>Fuel cell and Power factor improvement.</b>	<b>11 hrs</b>
42	<b>Fuel cells-</b> Define fuel cell. Classification of fuel cells.	1hr
43	Working principle and operation of phosphoric acid fuel cell (PAFC).	1hr
44	Working principle and operation of alkaline fuel cell (AFC).	1hr
45	Working principle and operation of polymer Electrolyte Membrane fuel cell (PEMFC).	1hr
46	Explain the performance limiting factors of fuel cell and Losses of fuel cells.	1hr
47	Advantages of fuel cells, applications and Environmental Impact of fuel cells.	1hr
48	<b>Hybrid PV systems-</b> Types of hybrid PV systems.	1 hr
49	Explain with block diagram PV-Diesel hybrid system, PV-Wind hybrid system and, PV-fuel cell hybrid system.	1 hr
50	<b>Power factor improvement-</b> Meaning of power factor and its significance. Causes of low power factor.	1hr
51	Effects of low power factor on power plant. Methods of power factor improvement.	1hr
52	Explain of methods of power factor improvement. Selection of capacitor bank to improve power factor.	1hr

## Model Question Paper:

Code: 15EE32T

III Semester Diploma Examination  
**ELECTRICAL POWER GENERATION**

Time: 3 Hours

Max Marks: 100

- Note:** i) Answer any SIX questions from PART - A. Each question carries 5 marks.  
ii) Answer any SEVEN Questions from PART - B. Each question carries 10 marks.

### PART – A

1. State the Sources of Electrical Energy.
2. List any three merits and demerits of Hydro power plant.
3. List the applications of Diesel power plant.
4. Describe the Construction of PV array.
5. Explain with neat sketches the Nature of winds.
6. Classify the types of Tidal power plant.
7. Explain the performance limiting factors of fuel cell.
8. Draw and explain the line diagram of biomass power plant.
9. Mention the effects of low power factor on power plant.

### PART – B

1. a) Explain with sketch the general layout hydro electric power plant . 6  
b) List any four factors to be considered for selection of site thermal (steam) power Plant. 4
2. a) Compare thermal and hydro power plants. 4  
b) Explain with neat schematic diagram the Nuclear power plant and mention the function of Each component. 6
3. a) Explain with neat schematic diagram the construction and working of Gas turbine power plant. 6  
b) List the any four factors to be considered for selection of site nuclear power plant. 4
4. a) Explain the Construction of solar cell and solar photovoltaic module with block Diagram. 6

- b) List the environmental effects of solar PV system. 4
- 5. a) Explain the Materials used for solar cells. 5
- b) Explain Environmental Impact of wind. 5
- 6. a) Explain the Construction of horizontal axis wind turbine generator with diagram. 7
- b) List the factors to be considered for site selection. 3
- 7. a) Explain with diagram single basin type tidal power plant. 5
- b) Explain the construction and working of Heaving float type, pitching type. 5
- 8. a) with neat sketch explain the line diagram of biomass power plant. 5
- b) Explain the Working principle and operation of alkaline fuel cell (AFC). 5
- 9. a) List the Advantages of fuel cells. 3
- b) Explain with block diagram the construction & working of PV-Wind hybrid system. 7
- 10. a) List the Merits and demerits biomass power plant. 5
- b) Mention the causes and effects of low power factor on power plant. 5

III Semester Diploma Examination  
**ELECTRICAL POWER GENERATION**

**MODEL QUESTION BANK**

**UNIT-I**

**Cognitive Level: REMEMBER**

1. State the Sources of Electrical Energy.
2. List the Factors to be considered for selection of site.
3. List any three merits and demerits of Hydro power plant.
4. With neat sketch explain the general layout hydro electric power plant and mention the function of any three components.

**Cognitive Level: UNDERSTAND**

5. Classify hydroelectric power plants based on the available head of water, plant capacity, load and construction.
6. Explain the Meaning of water hammer and its effect.
7. Explain the Environmental Impact of Hydrol power plant.
8. With neat sketch explain construction and working of thermal power plant
9. Compare thermal and hydro power plants.
10. List the Factors to be considered for selection of site thermal (steam) power plant.
11. Explain with neat sketch General layout of f thermal power plant.
12. Explain the Working of thermal power plant.
13. Compare thermal power plant with hydroelectric power plant.
14. Explain the Environmental Impact of Thermal power plants such as Air pollution and Stack emissions, Environmental Impact of Thermal power plants such as Sulphur- dioxide impacts, Nitrogen oxide impacts, Air borne particulates impacts and cooling tower.

**UNIT-II**

**Cognitive Level: UNDERSTAND**

15. List the factors to be considered for selection of site nuclear power plant.
16. With neat sketch explain construction and working of Nuclear power plant
17. With neat sketch explain construction and working of Diesel power plant
18. List the applications of Diesel power plant.

**Cognitive Level: APPLICATION**

19. Explain Nuclear power plant impacts such as Health physics, nuclear wastes and nuclear waste disposal List.
20. List Comparison between thermal power plant with nuclear power plant.
21. List the merits and demerits of Diesel power plant
22. With neat sketch explain construction and working of a Gas turbine power plant

## **Unit-III**

### **Cognitive Level: UNDERSTAND**

23. Explain Photovoltaic effect and solar power.
24. Explain the Construction of solar cell and solar photovoltaic module with block
25. diagram.
26. Explain Construction of photovoltaic panel.
27. state the Classification of solar photovoltaic systems.
28. List the Advantages and dis-advantages of PV systems.

### **Cognitive Level: APPLICATION**

29. Explain Construction of PV array.
30. Explain the Materials used for solar cells.
31. Explanation of stand-alone with block diagram
32. Explanation of grid interactive solar PV system with block diagram.
33. Explain the environmental effects of solar PV system.

## **UNIT-IV**

### **Cognitive Level: UNDERSTAND**

34. Explain the origin of Global and local winds.
35. List Factors affecting distribution of wind energy on surface of the earth.
36. Explain with neat sketches the Nature of winds.
37. List the factors to be considered for site selection.
38. List the classification of wind power plant based on plant capacity & wind turbine
39. Generator.
40. List the Comparison between horizontal axis and vertical axis wind turbine generator.

### **Cognitive Level: APPLICATION**

41. Explain the Importance of Wind Energy.
42. Explain the Construction of horizontal axis wind turbine generator with diagram.
43. Explain the Construction of vertical wind turbine generator with diagram.
44. Explain Environmental Impact of wind.

## **UNIT-V**

### **Cognitive Level: UNDERSTAND**

45. State the factors to be considered for site selection of tidal power plant.
46. Explain Origin and nature of Tidal Energy.
47. Classify the types of Tidal power plant.
48. Classification wave energy devices.
49. List Advantages and Dis-advantages of wave energy.
50. Explain working principle of ocean thermal energy conversion.
51. List advantages and dis- advantages OTEC plants.
52. List the Importance of biomass energy and its scope.
53. List the Factors to be considered for site selection.
54. List the types of biogas plants.
55. Brief explains of batch type, continuous type, and movable drum type and fixed dome

56. types
57. List the Compare movable and fixed dome type's biogas plants.
58. List the Merits and demerits biomass power plant.

### **Cognitive Level: APPLICATION**

59. Explain with diagram single basin and double basin type tidal power plant.
60. List the merits and demerits Tidal power plant.
61. Explain the construction and working of Heaving float type, pitching type.
62. Explain the construction and working of Heaving and pitching type wave Devices.
63. Explain with block diagram the open and closed cycle OTEC plants.
64. Explain with block diagram municipal solid waste to energy incineration plant.
65. Explain with neat the line diagram working of biomass power plant.
66. Explain the Construction of movable drum type biogas plant with diagram.
67. Explain the Construction of fixed dome type biogas plant with diagram.

### **Unit-VI**

### **Cognitive Level: UNDERSTAND**

68. Define fuel cell. And Classification of fuel cells.
69. Explain the Working principle and operation of phosphoric acid fuel cell (PAFC).
70. List the Advantages of fuel cells.
71. List the Applications
72. List the Causes of low power factor.
73. Mention the effects of low power factor on power plant.
74. Explain selection of capacitor bank to improve power factor.
75. Explain the Losses of fuel cells,

### **Cognitive Level: APPLICATION**

76. Explain the Working principle and operation of alkaline fuel cell (AFC).
77. Explain the Working principle and operation of polymer Electrolyte Membrane fuel cell
78. (PEMFC).
79. Explain the performance limiting factors of fuel cell.
80. Explain the Environmental Impact of fuel cells.
81. Explain Hybrid PV systems. Types of hybrid PV systems.
82. Explain with block diagram the construction and working of PV-Diesel hybrid system,
83. Explain with block diagram the construction and working of PV-Wind hybrid system
84. Explain with block diagram the construction and working of PV-fuel cell hybrid system.
85. Explain the Meaning of power factor and its significance.

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