

## OBJECTIVES

It introduces solar energy its radiation, collection, storage and application. It also introduces the wind energy, biomass energy, geothermal energy and ocean energy as alternative energy sources.

S. No	Question	Blooms Taxonomy Level	Course Outcome
<b>UNIT - 1</b> <b>PRINCIPLES OF SOLARRADIATION</b> <b>(SHORT ANSWER QUESTIONS)</b>			
1	Write a note on total solar energy received in India.	Understand	1
2	Define solar insolation	Understand	1
3	Define solar altitude angle	Understand	1
4	What are the advantages, and limitations of renewable energy sources	Understand	1
5	Explain briefly the different types of solar energy measuring instruments	Understand	1
6	Distinguish between diffuse radiation and beam radiation	Understand	1
7	Describe about solar geometry	Understand	1
8	What are conventional sources of energy	Understand	1
9	Explain the importance of solar energy in the present day energy crisis?	Understand	1
10	Explain solar azimuth angle and Zenith angle	Understand	1
<b>(LONG ANSWER QUESTIONS)</b>			
1	Write the important differences between renewable and non-renewable source	Understand	1

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2	Define solar constant	Understand	1
3	Explain and derive expression for beam and diffuse radiation	Understand	1
4	What are the reasons for variation in the amount of solar energy reaching earth's surface.	Understand	1
5	Explain why it is necessary to develop non-conventional method of generating electrical energy	Understand	1
6	Explain in detail the different types of solar energy measuring instruments	Understand	1
7	Write short note about the sun's declination and hour angle	Understand	1
8	Explain the working of a Pyrheliometer.	Understand	1
9	Write short note about sunshine recorder	Understand	1
10	Explain the working of a Pyranometer	Understand	1
<b>(ANALYTICAL QUESTIONS)</b>			
1	What is meant by solar radiation data? Explain the information contained in it	Analyze	2
2	Calculate the angle made by beam radiation with the normal to a flat collector on December 1 at 9 AM solar time for location at 28 Degree 35 Min North the collector is tilted at an angle of latitude + 10 Degree with horizontal and pointing due south	Evaluate	2
3	Explain and derive expression for beam and diffuse radiation	Remember	2
4	Describe about solar geometry	Understand	2
5	Explain why it is necessary to develop non-conventional method of generating electrical energy	Understand	2
6	Explain in detail the different types of solar energy measuring instruments	Understand	2
7	Determine the local solar time and declination at a location of latitude 25 Degree 15 Min N, Longitude of 77 Degree 30 Min E at 12.30 IST on June 19 <sup>th</sup> . { time correction = (-1'01'') }	Evaluate	2
8	Name and explain the instrument used for measuring total radiation	Understand	2
9	Describe the principle of Angstrom type Pyrheliometer	Understand	2
10	Explain the difference in the working of Pyrheliometer and pyranometer	Understand	2
<b>UNIT – II</b> <b>SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS</b> <b>(SHORT ANSWER QUESTIONS)</b>			
1	What are the main components of a flat plate solar collector, explain the function of each	Remember	1
2	Describe the classification of solar energy collectors	Remember	1
3	What is flat plate collector? explain its operation	Remember	1
4	Explain the different types of line focusing type concentrating type collectors	Analyze	1

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5	What are the applications of solar airheaters	Evaluate	1
6	Explain the different types of point focusing type concentrating type collectors	Understand	1
7	Explain non focusing type concentrating collectors	Remember	1
8	Explain central receiver tower	Remember	1
9	Explain Compound Parabolic Concentrator (CPC)	Understand	1
10	Explain the effects of various parameters affecting the performance of a collector?	Understand	4
11	Explain the different types of solar energy storage systems	Understand	2
12	What is a solar pond?	Remember	3
13	Explain in brief about the applications of solar energy	Remember	3
14	Explain solar water heating	Remember	3
15	Explain in detail solar space cooling	Understand	3
16	What are the different applications of solar PV system in rural India plot	Remember	3
17	What is the principle of solar photovoltaic power generation?	Remember	3
18	Explain the equivalent circuit for solar PV panel	Remember	3
19	Explain forced circulation solar water heater	Analyze	3
20	Explain in brief about passive heating systems	Remember	3
<b>(LONG ANSWER QUESTIONS)</b>			
1	Explain the principle of conversion of solar energy into heat	Understand	1
2	Describe the classification of solar energy collectors	Understand	1
3	What is flat plate collector? explain its operation	Understand	1
4	Explain the advantages of flat plate collectors	Understand	1
5	Explain the advantages of concentrating collectors	Understand	1
6	Explain the advantages of concentrating collectors over flat plate collectors	Understand	1
7	Explain the principle of operation of Fresnel lens collector	Understand	1
8	Explain Compound Parabolic Concentrators	Understand	1
9	Explain the performance analysis of Cylindrical Parabolic Concentrator	Understand	1
10	Explain the different methods of sun tracking	Understand	1
11	Explain mechanical solar energy storage systems	Understand	1

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12	What are the applications of solarponds	Understand	1
13	Explain PVEffect	Understand	1
14	Explain in detail solar Spaceheating	Understand	1
15	Explain in detail solar distillation anddrying	Understand	1
16	With the help of a neat sketch describe a solar heating system using water heatingsolar collectors. What are the advantages and disadvantages of thismethod?	Understand	1
17	What are the advantages and disadvantages of PV solar energy conversionsystem	Understand	1
18	Explain with a neat sketch the working principle of standalone and gridConnected solarsystem.	Understand	1
19	Describe the working of a solar powerplant	Understand	1
20	Compare solar PV system with solar thermalsystem	Understand	1
<b>(ANALYTICAL QUESTIONS)</b>			
1	What are the main components of a flat plate solar collector, explain thefunction ofeach	Understand	2
2	Describe the classification of solar energycollectors	Understand	2
3	What is flat plate collector? explain itsoperation	Understand	1
4	Explain the different types of line focusing type concentrating typecollectors	Understand	1
5	Explain the advantages of flat platecollectors	Understand	1
6	Explain the advantages of concentrating collectors over flat platecollectors	Understand	1
7	Explain the principle of operation of Fresnel lenscollector	Understand	1
8	Explain in detail a typical liquidcollector	Understand	1
9	Explain the heat transport system used in liquidcollectors	Understand	1
10	What are the application of solar airheaters	Understand	1
11	Explain mechanical solar energy storagesystems	Understand	1
12	What arenon convective solar ponds? Explain the applications of solarponds.	Understand	1
13	Explain PVEffect	Understand	1
14	Explain in detail solar Spaceheating	Understand	1
15	Explain in detail solar distillation anddrying	Understand	1
16	With the help of a neat sketch describe a solar heating system usingwater heating solar collectors. What are the advantages and disadvantages ofthis method?	Understand	1
17	What are the advantages and disadvantages of PV solar energyconversion system	Understand	1

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18	Explain with a neat sketch the working principle of standalone and grid Connected solar system	Analyze	1
<b>UNIT - III</b> <b>WIND ENERGY, BIO-MASS</b> <b>(SHORT ANSWER QUESTIONS)</b>			
1	Mention two important wind turbine generator installations in India.	Understand	1
2	What is the type of generator used in wind power plant?	Understand	1
3	How the wind mills are classified	Understand	1
4	What are the disadvantages of wind power?	Understand	1
5	What is meant by pitch angle?	Understand	1
6	Explain vertical wind mills with neat sketch	Understand	1
7	Constant speed constant frequency WTG unit	Understand	2
8	Variable speed constant frequency WTG system	Understand	2
9	Nearly constant speed constant frequency system	Understand	2
10	Explain the mechanism of production of local winds	Understand	2
11	What are the constituents of biogas	Understand	1
12	Mention some organic materials used in bio-mass plant.	Understand	1
13	What are the factors affecting biogas generation	Understand	2
14	What is meant by liquefaction?	Understand	1
15	What are wet processes used for producing biogas	Understand	2
16	Explain the classification of biogas plants	Understand	2
17	Explain Deenbandhu type plant	Understand	2
18	Explain the utilization of biogas plant	Understand	2
19	Explain dry processes	Understand	2
20	Explain continuous and batch processes	Understand	2
<b>(LONG ANSWER QUESTIONS)</b>			
1	Write and explain wind power equation	Understand	1
2	Define Tip speed ratio.	Understand	1
3	What are the advantages of wind power?	Understand	1
4	Define Vertical Axis Wind Turbine (VAWT).	Understand	1

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5	Explain Horizontal axis wind mills with neatsketch	Understand	1
6	What is meant by pitch control and Yawcontrol	Understand	1
7	Constant speed constant frequency WTGunit.	Understand	2
8	Nearly constant speed constant frequencysystem	Analyze	4
9	What is the principle used in the measurement of speed of thewind?	Understand	3
10	Explain the main applications of windenergy	Understand	1
11	What is the difference between Bio mass and biogas	Understand	2
12	Explain about dry and wet fermentationprocess	Understand	1
13	Explainpyrolysis	Understand	4
14	Explain the classification of biogasplants	Understand	1
15	Explain Chinese Typeplants	Understand	4
16	Explain floating drum type biogasplants	Understand	1
17	Explain the operation of IC engine with biogas anddiscuss their performancecharacteristics	Understand	3
18	What are the classifications of geo thermalsources?	Understand	3
19	What are the various factors affecting bio digestion of agas?	Understand	1
20	Explain KVICDigester	Understand	1
<b>(ANALYTICAL QUESTIONS)</b>			
1	Explain lift and dragforces	Understand	1
2	Analyse Aero Dynamic forces acting on theblade	Understand	1
3	Explain brief about Darrieus Rotor	Understand	1
4	Explain in brief about Savonius Rotor	Understand	1
5	Explain the scheme for electricgeneration	Understand	1
6	What is meant by pitch control and Yawcontrol	Understand	1
7	Explain Betz criterion and derive an expression for thesame.	Understand	1
8	What is the type of generator used in wind powerplant?	Analyze	2
9	How the wind mills areclassified	Analyze	2
10	What are the main applications of windpower?	Analyze	3
11	What is the difference between Bio mass and bio gas	Understand	3

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12	Explain about dry and wet fermentation process	Understand	3
13	How are Gasifiers classified? Explain pyrolysis	Understand	3
14	Explain the classification of biogas plants	Understand	3
15	Explain Chinese Type plants	Understand	3
16	Explain the classification of biogas plants	Understand	3
17	Explain the modification of SI engines to use biogas	Understand	1
18	What is the community Bio Gas plant	Understand	1
19	Explain the modification of CI engines to use biogas	Understand	1
20	What is meant by energy plantation	Understand	1
<b>UNIT - IV</b> <b>GEOTHERMAL ENERGY, OCEAN ENERGY</b> <b>(SHORT ANSWER QUESTIONS)</b>			
1	What is geothermal power?	Understand	2
2	What are the classifications of geothermal fields	Understand	2
3	Describe a vapor dominated or dry steam field	Understand	2
4	Discuss the disadvantages of geothermal plant	Understand	2
5	Write about the concept of interconnecting geothermal-fossil system	Understand	2
6	Discuss the advantages of geothermal plant	Understand	2
7	What is the potential of geothermal energy in India	Understand	2
8	Explain the working of a vapor-dominated power plant	Understand	2
9	What are the types of liquid dominated hydrothermal convective systems	Understand	2
10	Explain the applications of geothermal energy	Understand	2
11	Explain the different types of energy that can be generated from ocean	Understand	3
12	Explain in brief the principles of OTEC energy utilization	Understand	3
13	Explain in brief the principles of obtaining energy from the tides	Understand	3
14	What are the advantages and limitations of tidal power generation	Understand	3
15	What are the classifications of small hydro power stations	Understand	3
16	Explain how electrical energy can be generated from tidal plant	Understand	3
17	What are the main types of OTEC power plants	Understand	3

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18	Write short note about wave energy conversion methods	Understand	1
19	Explain in brief the single basin arrangement	Understand	1
20	Mention the advantages of small scale hydroelectric power generation	Understand	1
<b>(Long Answer Questions)</b>			
1	What are the classifications of geothermal sources	Understand	1
2	Explain Hot Dry rocks (petro thermal) resources of geothermal energy and how they can be exploited as a source of energy	Understand	1
3	Explain vapour dominated hydrothermal power plant with neat sketch and its representation on T-S diagram	Understand	1
4	With the help of neat diagram, explain the working of geothermal-preheated hybrid	Understand	1
5	Explain how electrical energy can be generated from geothermal energy	Understand	1
6	With the help of neat diagram, explain the working of geothermal-preheated hybrid system	Understand	4
7	What are liquid dominated hydrothermal Convective systems? Write about them	Understand	4
8	With the help of a neat diagram, explain the working of a liquid dominated single flash steam system	Understand	5
9	Explain the fossil superheat hybrid system with a neat schematic	Understand	4
10	Explain the application of geothermal energy	Understand	4
11	Explain the principle on which OTEC plants are based on	Understand	3
12	Explain OTEC open cycle	Understand	1
13	Explain OTEC closed (Anderson) cycle	Understand	1
14	What are the advantages and limitations of wave energy	Understand	3
15	Explain in brief about wave energy conversion devices	Understand	3
16	Explain in detail about mini hydro plants	Understand	1
17	What is the minimum tidal range required for the working of tidal power plant?	Understand	1
18	Draw the schematic layout of a tidal powerhouse	Understand	4
19	Explain how power can be generated using single basin arrangement in detail	Understand	4
<b>(Analytical Questions)</b>			
1	What are the classifications of geothermal sources	Understand	2
2	Explain Hot Dry rocks (petro thermal) resources of geothermal energy and how they can be exploited as a source of energy	Understand	2



S. No	Question	Blooms Taxonomy Level	Course Outcome
3	Explain vapour dominated hydrothermal power plant with neat sketch and its representation on T-S diagram	Understand	2
4	With the help of neat diagram, explain the working of geothermal-preheat hybrid system	Understand	2
5	Explain how electrical energy can be generated from geothermal energy	Understand	2
6	With the help of neat diagram, explain the working of geothermal-preheat hybrid system	Understand	2
7	What are liquid dominated hydrothermal Convective systems?	Understand	2
8	With the help of a neat diagram, explain the working of a liquid dominated single flash steam system	Understand	2
9	Explain the inter connection of Geo Thermal Fossil Systems	Understand	2
10	Explain in brief the different types of prime movers for Geo Thermal energy conversion	Understand	2
11	Explain the principle on which OTEC plants are based on	Understand	1
12	Explain OTEC open cycle	Understand	1
13	Explain OTEC closed (Anderson) cycle	Understand	1
14	What are the advantages and limitations of wave energy	Understand	1
15	Explain in brief about wave energy conversion devices	Understand	1
16	Explain in detail about mini hydel plants	Understand	1
17	Explain hybrid cycle	Understand	1
18	Explain the components of tidal power plants	Understand	1
19	Explain the difference between single Basien and double basien arrangements	Understand	1
20	Write short note about the different types of turbines used for microhydel plant	Understand	1
<b>UNIT - V</b> <b>DIRECT ENERGY CONVERSION</b> <b>(SHORT ANSWER QUESTIONS)</b>			
1	What is meant by Direct Energy Conversion	Understand	1
2	Explain Carnot cycle?	Understand	1
3	What is Joule Thomson effect	Understand	1
4	Explain The Principle Of Thermo Electric Power Generator	Understand	1
5	Explain the performance analysis of thermo electric power generator	Understand	1
6	What is Seebeck Thermo Electric Effect	Understand	1
7	What is meant by Direct Energy Conversion	Understand	1

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8	Derive the expression for the power and efficiency of thermionic generator	Understand	1
9	What are the advantages of MHD generation	Understand	1
10	Explain the materials used for MHD generation	Understand	1
<b>(LONG ANSWER QUESTIONS)</b>			
1	What is meant by Direct Energy Conversion	Understand	1
2	Explain Carnot cycle?	Understand	1
3	What is Joule Thomson effect	Understand	1
4	What is Seebeck Thermo Electric Effect	Understand	1
5	What are MHD generators? Explain its principle and working	Understand	1
6	Explain about various fuel cells and its applications	Understand	1
7	Explain the working of a thermoelectric generator	Understand	1
8	Explain the advantages and disadvantages of direct energy conversion	Understand	1
9	Explain the working of a Seebeck effect thermocouple	Understand	1
10	Write short notes on superconductivity and gas conductivity	Understand	1
<b>(ANALYTICAL QUESTIONS)</b>			
1	What is meant by Direct Energy Conversion	Understand	1
2	Explain Carnot cycle?	Understand	2
3	What is Joule Thomson effect	Understand	2
4	What is Seebeck Thermo Electric Effect	Understand	2
5	What is a MHD generator? Explain its principle and working	Understand	1
6	Explain about various fuel cells and its applications	Understand	1
7	Explain the working of a thermoelectric generator	Understand	1
8	Explain the advantages and disadvantages of direct energy conversion	Understand	1
9	Write short notes on Principles of DEC and Need for DEC	Understand	1
10	Explain direct energy conversion with any three examples	Understand	1