SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

V SEMESTER

1905508-RENEWABLE ENERGY SOURCES

Regulation – 2019

Academic Year 2022 – 2023 (ODD)

Prepared by

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SUBJECT: 1905508-RENEWABLE ENERGY SOURCES

SEM / YEAR: V / III

Academic Year: 2022 – 2023 (ODD)

UNIT I - PRINCIPLES OF SOLAR RADIATION				
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.				
PART-A				
Q.No	**Questions**	**BT Level**	**Competence**	**COs**
1	Discuss the role of renewable source.	BTL 3	Apply	CO1
2	List various energy resources.	BTL 5	Evaluate	CO1
3	Compose the environmental impact of solar power.	BTL 3	Apply	CO1
4	Define Solar Constant.	BTL 1	Remember	CO1
5	State the principle involved in generating solar power.	BTL 2	Understand	CO1
6	Summarize the factor influencing solar power extraction.	BTL 4	Analyse	CO1
7	Define solar azimuth angle and zenith angle.	BTL 1	Remember	CO1
8	List the advantage of solar concentrators.	BTL 5	Evaluate	CO1
9	Formulate the estimation of average solar radiation.	BTL 3	Apply	CO1
10	Define solar insolation.	BTL 1	Remember	CO1
11	State solar altitude angle.	BTL 1	Remember	CO1
12	Express the advantages and limitations of renewable energy sources.	BTL 5	Evaluate	CO1
13	Examine briefly the different types of solar energy measuring instruments.	BTL 5	Evaluate	CO1
14	Distinguish between diffuse radiation and beam radiation	BTL 2	Understand	CO1

15	What is solar geometry?	BTL 1	Remember	CO1
16	What are conventional sources of energy?	BTL 1	Remember	CO1
17	Examine the importance of solar energy in the present day energy crisis.	BTL 5	Evaluate	CO1
18	How solar radiation data can be measured?	BTL 6	Create	CO1
19	Compose the extraterrestrial and terrestrial solar radiation.	BTL 4	Analyse	CO1
20	Examine with a short note on total solar energy received in India.	BTL 3	Apply	CO1
21	List out the applications of solar energy.	BTL 3	Apply	CO1
22	Explain the mode of heat transfer of solar energy.			CO1
23	Why is the solar constant important?	BTL 2	Understand	CO1
24	What are some environmental impacts of solar energy?	BTL 2	Understand	CO1
	PART-B			
1	Write the important differences between renewable and nonrenewable source. (13)	BTL 1	Remember	CO1
2	Compose the types of energy resources in detail. (13)	BTL 4	Analyse	CO1
3	What is solar energy? Describe with the help of a neat sketch the working of a solar plant. (13)	BTL 2	Understand	CO1
4	Explain (i)extraterrestrial radiation (4) (ii)solar constant (5) (iii)terrestrial radiation (4)	BTL 2	Understand	CO1
5	Explain and derive expression for beam and diffuse radiation. (13)	BTL 4	Analyse	CO1
6	What are the reasons for variation in the amount of solar energy reaching earth surface? (13)	BTL 1	Remember	CO1
7	Evaluate why it is necessary to develop non-conventional method of generating electrical energy. (13)	BTL 5	Evaluate	CO1
8	Explain in detail the different types of solar energy measuring instruments. (13)	BTL 4	Analyse	CO1
9	Write short note about the basic sun-earth angles. (13)	BTL 1	Remember	CO1
10	Elaborate physics of the sun. (13)	BTL 1	Remember	CO1
11	Examine the working of a pyrheliometer. (13)	BTL 3	Apply	CO1
12	Write short note about sunshine recorder. (13)	BTL 1	Remember	CO1

13	Examine the working of a pyranometer. (13)	BTL 3	Apply	CO1
14	Express extraterrestrial and terrestrial solar radiation. (13)	BTL 2	Understand	CO1
15	Explain in detail about solar radiation on titled surface. (13)	BTL 2	Understand	CO1
16	What do you understand by solar radiation data? What is the need of solar radiation data? (13)	BTL 4	Analyse	CO1
17	(i)Calculate the angle made by beam radiation with the normal to a flat plate collector on 1 December at 09.00 h (LAT). The collector is located at a place (28° 35' N, 77° 12' E) and it is tilted at angle of 36° with the horizontal. It is also pointing due south. (9) (ii) Calculate the zenith angle of the sun at a place (26.75° N) at 9.30 on 16 February. (4)	BTL 6	Create	CO1
PART-C				
1	Explain and derive expression for beam and diffuse radiation. (15)	BTL 6	Create	CO1
2	Compose the instruments used for measuring total radiation. (15)	BTL 5	Evaluate	CO1
3	How can solar energy be converted into electrical energy? Give a diagram showing the elements of such a plant. (15)	BTL 5	Evaluate	CO1
4	Explain the difference in the working of pyrheliometer and pyranometer. (15)	BTL 5	Evaluate	CO1
5	Determine the average value of solar radiation on a horizontal surface for June 22, at the latitude of 10°N, if constants a and b are given as equal to 0.30 and 0.51 respectively, and the ratio $\frac{\overline{n}}{N} = 0.55$. (13)	BTL 6	Create	CO1
UNIT II - SOLAR ENERGY COLLECTION				
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.				
PART-A				
Q.No	**Questions**	**BT Level**	**Competence**	**COs**
1	Why solar collectors are needed?	BTL 5	Evaluate	CO2
2	What are the main components of a flat plate solar collector?	BTL 2	Understand	CO2

3	List out the various types of flat plate collectors.	BTL 2	Understand	CO2
4	Classify the types of solar energy collectors.	BTL 3	Apply	CO2
5	List the classification of concentrating collectors.	BTL 2	Understand	CO2
6	What is flat plate collector?	BTL 2	Understand	CO2
7	Differentiate flat plate collectors and concentrating collectors.	BTL 5	Evaluate	CO2
8	Define concentrating collector.	BTL 1	Remember	CO2
9	Write briefly about non focusing type concentrating collectors			CO2
10	What is central receiver tower?	BTL 2	Understand	CO2
11	Express Compound Parabolic Concentrator(CPC)	BTL 4	Analyse	CO2
12	Classify the different types of point focusing type concentrating type collectors.	BTL 4	Analyse	CO2
13	List the different types of line focusing type concentrating type collectors	BTL 2	Understand	CO2
14	Express the applications of solar air heaters.	BTL 3	Apply	CO2
15	Examine the effects of various parameters affecting the performance of a collector.	BTL 5	Evaluate	CO2
16	Examine the important factors governing the selection of site for conventional sources.	BTL 3	Apply	CO2
17	Compose the energy balance equation for solar collector.	BTL 2	Understand	CO2
18	Define collector efficiency	BTL 1	Remember	CO2
19	What is temperature range of solar collectors?	BTL 1	Remember	
20	What is modified flat plate solar collector?	BTL 1	Remember	CO2
21	Define concentration ratio.	BTL 1	Remember	CO2
22	At what wavelength the radiation emitted from the sun and that reflected from the earth are centred.	BTL 6	Create	CO2
23	Summarize the temperature range of solar collectors.	BTL 4	Analyse	CO2
24	What is modified flat plate solar collector?	BTL 1	Remember	CO2
PART-B				
1	Describe the classification of solar energy collectors. (13)	BTL 1	Remember	CO2
2	What is flat plate collector? Explain its operation. (13)	BTL 1	Remember	CO2
3	Examine the working principle of various	BTL 2	Understand	CO2

	types of concentrating solar collectors with neat sketch. (13)			
4	List the main components of a flat plate solar collector. Explain the function of each. (13)	BTL 3	Apply	CO2
5	(i)What do you understand by central tower receiver collector? (7) (ii)Summarize the advantages and disadvantages of concentrating collectors over a flat plate collector. (6)	BTL 2	Understand	CO2
6	(i)Explain the principle of operation of Fresnel lens collector. (7) (ii)Describe a collector having tracking receiver or fluid tube. (6)	BTL 1	Remember	CO2
7	Explain compound parabolic concentrators. (13)	BTL 2	Understand	CO2
8	Express the principle of conversion of solar energy in to heat. (13)	BTL 1	Remember	CO2
9	Explain the performance analysis of cylindrical parabolic concentrator. (13)	BTL 4	Analyse	CO2
10	Explain the material selection for various parts of flat plate collectors. (13)	BTL 4	Analyse	CO2
11	Express the basic phenomenon of solar energy conversion with suitable diagram. (13)	BTL 5	Evaluate	CO2
12	Compose how a solar used for industrial heating system. (13)	BTL 3	Apply	CO2
13	How the solar air collector is classified? What is the main application of each? (13)	BTL 2	Understand	CO2
14	Describe the performance testing procedure of solar collectors. (13)	BTL 6	Create	CO2
15	Write in detail about solar thermal power stations. (13)	BTL 4	Analyse	CO3
16	Elaborate energy balance equation and collector efficiency. (13)	BTL 5	Evaluate	CO2
17	Explain selective absorber coatings. (13)	BTL 2	Understand	CO2
PART-C				
1	Explain the different types of solar collectors based on the way they collect solar radiation. (15)	BTL 5	Evaluate	CO2
2	Discuss in detail about thermal analysis of flat-plate collector and useful heat gained by the fluid. (15)	BTL 6	Create	CO2
3	Data for a flat plate collector used for heating	BTL 6	Create	CO2

	the building are given below: **Factor** / **Specification** Location and latitude: Baroda, 22°N Day and time: 1 January, 11: 30-12 : 30 (IST) Annual average intensity, of solar radiation: 0.5 langley /min Collector tilt: latitude + 15° No. of glass covers: 2 Heat removal factor for collector: 0.810 Transmittance of the glass: 0.88 Absorplance of the glass: 0.90 Top loss coefficient for collector: 7.88 W/ m^2 °C Calculate: (i) Solar altitude angle (5) (ii) Incident (5) (iii) Collector efficiency. (5)			
4	Explain the heat transport system used in liquid collectors. (15)	BTL 5	Evaluate	CO2
5	Discuss in detail about orientation and thermal analysis of solar collectors. (15)	BTL 5	Evaluate	CO2

UNIT III - SOLAR ENERGY STORAGE AND APPLICATIONS

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

PART-A

Q.No	Questions	BT Level	Competence	COs
1	What do you understand by solar energy storage?	BTL 2	Understand	CO3
2	Generalize the types of solar energy storage systems.	BTL 4	Analyse	CO3
3	Define sensible in solar energy storage	BTL 1	Remember	CO3
4	Define latent heat	BTL 1	Remember	CO3
5	List out the merits of latent heat storage.	BTL 6	Create	CO3
6	What is a solar pond?	BTL 1	Remember	CO3

7	Draw the layout of a solar pond,	BTL 3	Apply	CO2
8	What do you understand by solar distillation?	BTL 2	Understand	CO3
9	Brief about the applications of solar energy	BTL 4	Analyse	CO3
10	Compose the solar heating cooling techniques.	BTL 3	Apply	CO3
11	What do you understand by photovoltaic effect?	BTL 2	Understand	CO3
12	How do you differentiate a conductor, an insulator and a semiconductor?	BTL 2	Understand	CO3
13	Mention the components of solar cell.	BTL 2	Understand	CO3
14	Account on the Solar PV module.	BTL 5	Evaluate	CO3
15	What do you understand by solar PV array?	BTL 2	Understand	CO3
16	Compare a solar cell, module and an array.	BTL 5	Evaluate	CO3
17	Define fill factor.	BTL 1	Remember	CO3
18	State solar efficiency	BTL 1	Remember	CO3
19	What are the parameters limiting the performance of a cell?	BTL 1	Remember	CO3
20	How can the performance of a solar cell be maximized?	BTL 4	Analyse	CO3
21	How can you classify a solar PV system?	BTL 5	Evaluate	CO3
22	Analyze the merits and demerits of PV system.	BTL 4	Analyse	CO4
23	Prepare the features of solar PV programme in India.	BTL 3	Apply	CO3
24	Calculate the range of wavelength of solar radiation capable of creating electron-hole pair in silicon having energy gap of 1.12 eV.	BTL 6	Create	CO3
	PART-B			
1	How can classification of solar energy storage system be done? Explain them briefly. (13)	BTL 2	Understand	CO3
2	What are the main advantages and disadvantages of sensible heat storage with water as storage medium? Compare with them those of solid media storage. (13)	BTL 4	Analyse	CO3
3	What is meant by solar pond? Explain in detail. (13)	BTL 1	Remember	CO3
4	Express the mechanism of solar heating cooling technique. (13)	BTL 1	Remember	CO3
5	Explain in detail solar distillation and drying.			CO3

	(13)			
6	Explain with a neat sketch the working principle of standalone and grid connected solar system. (13)	BTL 2	Understand	CO3
7	(i)Write a detailed note on the fundamentals of a solar cell. (13) (ii)Explain the principle of solar power in detail	BTL 1	Remember	CO3
8	Describe the construction of solar cell and solar PV panel. (13)	BTL 1	Remember	CO3
9	Account on the voltage current characteristics of a solar cell. (13)	BTL 2	Understand	CO3
10	Discuss the materials used for fabrication of PV cells. (13)	BTL 3	Apply	CO3
11	Elucidate the characteristics of a solar cell. (13)	BTL 4	Analyse	CO3
12	Prepare the design considerations of the solar cell. (13)	BTL 3	Apply	CO3
13	Explain the following (i) Cell mismatch in PV module. (6) (ii)Effect of shadowing. (7)	BTL 2	Understand	CO3
14	Analyze the effect of solar cell in water pumping. (13)	BTL 4	Analyse	CO3
15	i) A P type silicon has effective density of states in valence bands as $1*10^{22}$ per cm^3.An impurity from IIIrd group with concentration of $1*10^{19}$ per cm^3 is added. If band gap for silicon is 1.12eV, find the closeness of Fermi level with valence band at the temperature of 27^{o}C. (7) ii) A Si sample is doped with $1*10^{17}$ atoms/cm^3 Phosphorous atom. What will be the minority hole concentration, p_o at room temperature. (6)	BTL 6	Create	CO3
16	Explain various factors contributing to losses in solar cells. How is the efficiency reduced due to these factors? (13)	BTL 5	Evaluate	CO3
17.	i) Write down your comments on cost reduction of solar cell. (9) (ii) “Sunshine is free, but solar energy is not”-	BTL 5	Evaluate	CO3

	Discuss. (6)			
PART-C				
1	Explain the operation of standalone and grid connected PV system. (15)	BTL 5	Evaluate	CO3
2	Summarize the latent heat and stratified storage in solar energy. (15)	BTL 5	Evaluate	CO3
3	Compose the different application of solar energy. (15)	BTL 6	Create	CO3
4	Examine in detail about the photovoltaic energy conversion and state the advantage and disadvantage of PV solar energy. (15)	BTL 5	Evaluate	CO3
5	A house has one 18 Watt fluorescent lamp with electronic ballast used 4hours per day, one 60W fan used for four hours per day and one 75W refrigerator that runs twenty seven hours per day with compressor run twelve hours and off 12hours.The system will be powered by 12V dc,100Wp PV modules. Design a suitable PV system. (15)	BTL 6	Create	CO3
UNIT IV - WIND ENERGY				
Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.				
PART-A				
Q.No	**Questions**	**BT Level**	**Competence**	**COs**
1	How are winds classified?	BTL 2	Understand	CO4
2	Analyze the factors involved in estimation of wind energy at a site?	BTL 4	Analyse	CO4
3	Define capacity factor.	BTL 1	Remember	CO4
4	Define gradient height.	BTL 2	Understand	CO4
5	Mention some applications of wind power.	BTL 3	Apply	CO4
6	What is betz limit?	BTL 1	Remember	CO4
7	Define betz criterion.	BTL 1	Remember	CO4
8	What are the disadvantages of wind power?	BTL 1	Remember	CO4
9	What is meant by pitch angle?	BTL 1	Remember	CO4
10	Define horizontal axis wind turbine.	BTL 1	Remember	CO4
11	Compare and contrast HAWT and VAWT.	BTL 2	Understand	CO4
12	Illustrate the effect seen in the life of birds due to wind energy.	BTL 6	Create	CO4

13	What are the main components of HAWT?	BTL 2	Understand	CO4
14	What are the constituents of biogas?	BTL 2	Understand	CO4
15	Give some of the organic materials used in biomass plant.	BTL 6	Create	CO4
16	Define aerobic and anaerobic processes.	BTL 1	Remember	CO4
17	Define biomass production efficiency.	BTL 1	Remember	CO4
18	What is biomass? In what form biomass can be used?	BTL 3	Apply	CO4
19	Point out the factors affecting biogas generation.	BTL 4	Analyse	CO4
20	Illustrate commonly used bioenergy conversion processes.	BTL 4	Analyse	CO4
21	What are the advantages and disadvantages of biomass energy?	BTL 5	Evaluate	CO4
22	What are the factors considered while locating a biogas plant?	BTL 5	Evaluate	CO4
23	Name the various models of biogas plants.	BTL 4	Analyse	CO4
24	How biogas can be used in IC engines?	BTL 3	Apply	CO4
				CO4
PART-B				
1	(i)Describe the factors affecting the distribution of wind energy on the surface of the earth. (7) (ii)Account on the nature of the winds. (6)	BTL 1	Remember	CO4
2	What principles are used for measurement of wind? (13)	BTL 2	Understand	CO4
3	(i) Derive an expression for total power of a wind stream. (7) (ii) List the criteria for the site selection of a windmill. (6)	BTL 2	Understand	CO4
4	With the help of a neat diagram, formulate and explain the variation of wind speed with height from the ground. (13)	BTL 6	Create	CO4
5	Analyze the characteristics of wind in detail. (13)	BTL 4	Analyse	CO4
6	How energy from the wind is extracted? Explain the process using suitable diagram. (13)	BTL 4	Analyse	CO4
7	Generalize the importance of power duration curves with necessary diagrams. (13)	BTL 5	Evaluate	CO4

8	Discuss the various designs of rotors used for HAWT with its merits and demerits. (13)	BTL 2	Understand	CO4
9	Sketch the diagram of VAWT and explain the function of its main components. (13)	BTL 2	Understand	CO4
10	Account on the constructional details of horizontal axis wind turbine. (13)	BTL 4	Analyse	CO4
11	List out the classification of biogas plants and explain any two with neat sketch. (13)	BTL 1	Remember	CO4
12	What is the meaning of biomass? Further, discuss its multipurpose utilization. (13)	BTL 1	Remember	CO4
13	Describe in detail how biomass conversion takes place. (13)	BTL 1	Remember	CO4
14	Describe in detail the various factors affecting bio digestion of a gas. (13)	BTL 3	Apply	CO4
15	Differentiate between the following methods of biogas generation i). Pyrolysis (6) ii). Combustion (7)	BTL 2	Understand	CO4
16	Discuss the following methods of biogas generation i) Gasification (6) ii) Anaerobic Digestion (7)	BTL 2	Understand	CO4
17	Illustrate the operation of IC Engine with neat sketch. (13)	BTL 3	Apply	CO4
	PART-C			
1	How the wind mills are classified and explain the operation. (15)	BTL 5	Evaluate	CO4
2	Sketch the diagram of a HAWT and explain the functions of its main components. (15)	BTL 5	Evaluate	
3	With the help of a diagram, discuss the power versus wind speed characteristics of a wind turbine. (15)	BTL 6	Create	CO4
4	Compose the various models of biogas plants and describe any three of them. (15)	BTL 6	Create	CO4
5	i)What do you understand by energy plantation? (8) ii)What is the present status of development of biomass energy resources in India? (7)	BTL 5	Evaluate	CO4
	UNIT V - GEOTHERMAL ENERGY			
Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants,				

and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC, Magneto Hydro Dynamic power generation				
PART-A				
Q.No	**Questions**	**BT Level**	**Competence**	**COs**
1	What is geothermal power?	BTL 1	Remember	CO5
2	Describe Geothermal gradient.	BTL 1	Remember	CO5
3	Illustrate the drawbacks of geothermal energy.	BTL 2	Understand	CO5
4	Explain the concept of wet steam geothermal system.	BTL 5	Evaluate	CO5
5	Discuss hot dry rocks resources of geothermal energy.	BTL 2	Understand	CO5
6	Prepare the list of various application of geothermal energy.	BTL 3	Apply	CO5
7	What is tidal energy?	BTL 1	Remember	CO5
8	Summarize the advantages of tidal power generation.	BTL 4	Analyse	CO5
9	Illustrate the limitations of tidal power generation.	BTL 4	Analyse	CO5
10	List the factors that determines the maximum length and height of ocean waves.	BTL 5	Evaluate	CO5
11	Define ocean thermal energy.	BTL 1	Remember	CO5
12	Give the overall efficiency of an OTEC power plant.	BTL 5	Evaluate	CO5
13	Illustrate various types of OTEC power plants.	BTL 2	Understand	CO5
14	Illustrate OTEC open cycle.	BTL 3	Apply	CO5
15	Why does the potential of small hydropower sources remain untapped?	BTL 6	Create	CO5
16	List various types of hydropower plants.	BTL 2	Understand	CO5
17	Give the necessity of surge tank in hydropower plant.	BTL 4	Analyse	CO5
18	Classify the water turbines used in hydropower plant.	BTL 3	Apply	CO5
19	State Seeback effect.	BTL 1	Remember	CO5
20	Define Peltier effect.	BTL 1	Remember	CO5
21	Define Carnot cycle.	BTL 1	Remember	CO5
22	Discuss the applications of Thermoelectric generator.	BTL 4	Analyse	CO5
23	What is magneto hydrodynamic power conversion?	BTL 2	Understand	CO5
24	What are the major advantages and limitations	BTL 2	Understand	CO5

	of MHD generating system?			
	PART-B			
1	With a neat sketch explain the operation of wet steam liquid dominated geothermal power plant. (13)	BTL 2	Understand	CO5
2	Describe in detail the binary cycle system for liquid dominated system. (13)	BTL 1	Remember	CO5
3	(i)Explain a hot dry rock type Geothermal resource power plant. (7) (ii)What are the main differences between conventional thermal power plant and geothermal power plant? (6)	BTL 1	Remember	CO5
4	How are tidal plants classified on the basis of basins used? (13)	BTL 2	Understand	CO5
5	(i)What are the different modes of operation of a tidal power plant? (7) (ii)What are the factors affecting the feasibility of a tidal power plant? (6)	BTL 4	Analyse	CO5
6	Explain the working principle of OTEC plants. (13)	BTL 2	Understand	CO5
7	Discuss the following: i) OTEC open cycle. (6) ii) OTEC closed cycle. (7)	BTL 2	Understand	CO5
8	What do you understand by wave enemy devices? How are these classified? Explain the working principle of a few wave energy devices. (13)	BTL 4	Analyse	CO5
9	With a neat sketch explain the operation impoundment hydro power plant. (13)	BTL 1	Remember	CO5
10	Describe in detail the operation pumped storage hydro power plant. (13)	BTL 1	Remember	CO5
11	Demonstrate the following impulse turbine: i) Pelton (6) ii) Turgo turbine (7)	BTL 3	Apply	CO5
12	Explain the operation of the following reaction turbines i) Francis (6) ii)Kaplan (7)	BTL 3	Apply	CO5
13	Discuss about selection of water turbine based on capacity of the power plan, head and water flow rate. (13)	BTL 6	Create	CO5
14	Discuss the main features of the micro hydel	BTL 5	Evaluate	CO5

	schemes. (13)			
15	Analyze the working of a thermoelectric generator. Derive the expression for its power output. (13)	BTL 4	Analyse	CO5
16	Describe the principle of operation of an MHD generator. Derive an expression for maximum power generation per unit volume of the generator. (13)	BTL 2	Understand	CO5
17	i)Explain the operation of an MHD generating system. (7) ii)What are the major advantages and limitations of the MHD generating system?(6)	BTL 5	Evaluate	CO5
	PART-C			
1	Discuss various energy extraction techniques used with hydrothermal resources. (15)	BTL 5	Evaluating	CO5
2	Explain the various methods of tidal power generation. What are the limitations of each method? (15)	BTL 5	Evaluating	CO5
3	Discuss the propeller type of turbine used for hydroelectric projects with diagram. (15)	BTL 6	Create	CO5
4	What are the main research and development activities going on in India in the area of micro hydel schemes? (9) Micro hydro power is an option for socio-economic development. Comment. (6)	BTL 6	Create	CO5
5	How MHD systems are classified? Describe them in brief. (15)	BTL 5	Evaluate	CO5

Course Outcomes:

COs	Course Outcome
CO1	To understand the physics of solar radiation
CO2	Ability to classify the solar energy collectors and methodologies of storing solar energy.
CO3	To gain knowledge in applying solar energy in a useful way.
CO4	To gain knowledge in wind energy and biomass with its economic aspects.
CO5	To obtain knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.