Code No: R1941023 **R19** **Set No. 1**

IV B. Tech I Semester Regular Examinations, November – 2022
RENEWABLE ENERGY SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks
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UNIT-I

1	a)	Explain how to estimate solar radiation on Earth surface.	[7]
	b)	Describe renewable energy scenario in Andhra Pradesh.	[8]
		(OR)	
2	a)	Explain the non-conventional energy resources available in Indian energy scenario.	[7]
	b)	i). Write about Extra-terrestrial radiation and terrestrial radiation.	[8]
		ii). Calculate the angle made by the beam radiation with normal to a flat plate collector, pointing due south located New Delhi (28° 38'N, 77° 17'E) at 9:00 hr, solar time on December 1. The collector is tilted at an angle of 360 with the horizontal.	

UNIT-II

3	a)	Draw V-I characteristics of a solar cell and explain briefly.	[7]
	b)	Describe the Hill Climbing MPPT Technique using a neat algorithm and explain its advantages.	[8]
		(OR)	
4	a)	Draw and describe the analogous circuit of a practical solar PV cell.	[7]
	b)	Explain the outcome and different considerations that need to be taken care while connecting PV cells in series and parallel.	[8]

UNIT-III

5	a)	What are the advantages and disadvantages of Wind Energy Conversion? How wind mills are classified? What are the basic components of wind mills?	[7]
	b)	State different types of speed control strategies for wind turbine.	[8]
		(OR)	
6	a)	Distinguish between synchronous generator and Induction Generator.	[7]
	b)	Using the schematic diagram, explain the working of Doubly-Fed Induction Generation and its control for wind energy conversion system.	[8]

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UNIT-IV

7	a)	Explain the potential and kinetic energies associated with wave energy.	[7]
	b)	Explain with neat sketches the various methods of tidal power generation.	[8]
		(OR)	
8	a)	What are the advantages and limitations of small-scale hydro-electric power generation	[7]
	b)	Write a note on, tidal energy conversion.	[8]

UNIT-V

9	a)	Discuss economic aspects of biogas.	[7]
	b)	Explain the energy extraction technique from hot dry rock.	[8]
		(OR)	
10	a)	List out the differences between anaerobic and aerobic digestion systems.	[7]
	b)	Explain the potential of geothermal sources in India.	[8]

Code No: R1941023 **R19** **Set No. 2**

IV B. Tech I Semester Regular Examinations, November – 2022
RENEWABLE ENERGY SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks
*****

UNIT-I

1	a)	What is the present status of various modes of renewable power generations in India? Explain.	[7]
	b)	What are the reasons for variation in solar radiation reaching the earth than received at the onside of the atmosphere?	[8]
		(OR)	
2	a)	Define and explain the following angles as related to solar geometry: (i) Surface azimuth angle (ii) Declination angle (iii) Latitude angle iv) inclination angle and iv) angle of incidence.	[7]
	b)	What is a flat plate collector? Explain its operation in detail with neat diagrams.	[8]

UNIT-II

3	a)	Explain the V-I characteristics for a PV cell.	[7]
	b)	Describe the configuration of the PV system and emphasize the importance of the converter circuit and MPPT block in it.	[8]
		(OR)	
4	a)	Explain from solar photovoltaic cells to a module and from module to Arrays?	[7]
	b)	Explain the current – voltage characteristics of a solar cell and define Fill Factor and give its significance.	[8]

UNIT-III

5	a)	List out the differences between horizontal and vertical axis wind mills.	[7]
	b)	The following data relate to a wind turbine: Velocity of wind at 15°C= 10 m/s Turbine diameter =10m Operating speed of the machine =35 rpm at maximum efficiency of 40% .Calculate: i) total power density in the wind stream ii) The maximum power density iii) The actual power density iv) Power output of the turbine	[8]

(OR)

6 a) Explain the advantages and limitations of wind energy conversion systems. [7]

b) Discuss the performance characteristics of wind. [8]

UNIT-IV

7 a) What is small hydro power? How is it classified? Obtain an expression for the power that can be generated from a small hydro power station. [7]

b) What are the advantages and limitations of wave energy conversion? [8]

(OR)

8 a) Enumerate the difficulties in tidal power developments? [7]

b) Discuss the propeller type of turbine used for hydroelectric projects with diagram. [8]

UNIT-V

9 a) Identify the applications of biomass energy along with its impact on environment. [7]

b) What is the geothermal energy? Explain its extraction process. [8]

(OR)

10 a) What is the present state of development in the fuel cell technology? [7]

b) With line diagram, explain the heat extraction from hot dry rocks. [8]

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Code No: R1941023 **R19** **Set No. 3**

IV B. Tech I Semester Regular Examinations, November – 2022
RENEWABLE ENERGY SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks
*****

UNIT-I

1	a)	Describe the energy scenario in India. What are the various non-conventional energy resources relevant to India?	[7]
	b)	i. What is solar constant? What is the expression for solar constant? ii. Calculate the sunset hour angle and day length at location latitude of 350N, on Feb 14.	[8]
		(OR)	
2	a)	What are energy resources available in India? Explain	[7]
	b)	What are the different instruments used for the measurement of solar radiation? Explain in detail.	[8]

UNIT-II

3	a)	Define the following parameters for solar cell: i) Short-circuit current ii) Open-circuit voltage iii) Fill Factor iv) Efficiency of solar cell State the relationship between these factors.	[7]
	b)	Explain maximum power point tracking procedure for a photovoltaic System.	[8]
		(OR)	
4	a)	Discuss the effect of temperature and insolation on the characteristics of solar cell. Draw the P-V characteristics of Solar cell under varying temperature and irradiation level.	[7]
	b)	Show the components of PV system with energy storage device. Also, draw energy flow diagram for this system. Write the broad steps of design for this configuration.	[8]

UNIT-III

5	a)	Derive that the maximum power that can be extracted from a horizontal axis wind turbine is only 59.5%.	[7]

	b)	State the following terms with expressions: i). Power contained in Wind ii). Power coefficient iii). Torque acting on turbine iv). Torque-Speed ratio v). Wind turbine efficiency	[8]

(OR)

6	a)	Describe the different types of wind turbines in brief.	[7]
	b)	A HAWT having the rotor diameter as 80m is rotating at 40 rpm. The wind speed is 20 m/s at 1 atm and 27°C. Calculate the torque produced at the shaft for maximum output of the turbine.	[8]

UNIT-IV

7	a)	Write down the major components of a tidal power plant and describe the basic principle of tidal energy production.	[7]
	b)	Explain the design and selection of different types of turbines used for small hydro plants.	[8]

(OR)

8	a)	Explain the methods for the utilization of tidal energy in single basin Arrangement?	[7]
	b)	Explain wave energy conversion technique in detail with neat layout diagrams.	[8]

UNIT-V

9	a)	Explain the process of anaerobic digestion of biomass into biogas. Draw the schematic diagram of a biodigestor.	[7]
	b)	What are the possible sources of geothermal pollution? How to avoid them?	[8]

(OR)

10	a)	What are different technologies used in biomass to energy conversion	[7]
	b)	Describe the fuel cell V-I characteristics using a neat sketch.	[8]

Code No: R1941023 **R19** **Set No. 4**

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Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
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*****

UNIT-I

1	a)	Write short notes on the advantages and disadvantages of any three types of non-conventional energy sources.	[7]
	b)	Define Solar Constant. Calculate the number of daylight hours in Srinagar for 22nd June. The latitude of Srinagar as $34^0 05'$N.	[8]
		(OR)	
2	a)	Elaborate the availability and limitations of conventional sources of energy and its impact on human life. What are the alternate solutions?	[7]
	b)	Illustrate the functions of various components in flat plate collectors.	[8]

UNIT-II

3	a)	Explain the importance of Fill Factor (FF) in a solar cell and derive its expression. Also, discuss in details the efficiency of solar cell.	[7]
	b)	For various input quantities of irradiance and temperature, draw and describe the P-V and I-V characteristics of the PV system.	[8]
		(OR)	
4	a)	Write a short note on sizing of PV system and its storage.	[7]
	b)	List different methods for determining the solar PV system's Maximum Power Point and discuss the P&O method.	[8]

UNIT-III

5	a)	Derive the expression for power extracted from the wind.	[7]
	b)	With neat diagram explain the working principle of horizontal axis wind turbine.	[8]
		(OR)	
6	a)	Explain how variation in tower height varies the different parameters in wind energy system.	[7]

b) A horizontal shaft, propeller type wind-turbine is located in area having speed of wind 10 m/s at 1 atm and 15°C.Calculate the following: [8]
   i). Air density ρ, kg/m^3
   ii). Total power density in wind stream, W/m^2
   iii). Maximum possible obtainable power density, W/m^2
   iv). Total power from the wind-turbine of 120 m dia.

UNIT-IV

7 a) Explain the design and selection of different types of turbines used for small hydro plants. [7]

b) Explain the principle of operation of a tidal power plant. How it is classified? Draw the layout of a double basin tidal power plant and label all the components. [8]

(OR)

8 a) List the benefits and limitations of small-scale hydroelectric power system. [7]

b) Obtain an expression for the power that a tidal power system produces. [8]

UNIT-V

9 a) Explain how a hydrogen fuel cell operates using a line diagram. [7]

b) What is geothermal energy? How can geothermal energy be utilized for electric power generation? [8]

(OR)

10 a) Explain the geo thermal resources. How the electric power can be developed from geothermal resources? [7]

b) Explain about various fuel cells and its applications. [8]