Code No: R1631022   **R16**   SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021
RENEWABLE ENERGY SOURCES
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**
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PART –A   (14 Marks)

1. a) Differentiate renewable energy from non-renewable energy with examples. [2M]

    b) Write a short note on solar pond. [3M]

    c) What is the implication of cell mismatch in a solar module? [2M]

    d) Give the typical specifications of a wind turbine for the power generation. [2M]

    e) Write the expressions for kinetic energy and power output for a wave. [3M]

    f) List out the major applications of geothermal energy. [2M]

PART –B   (56 Marks)

2. a) What are the prospects of renewable energy sources in India? [7M]
    b) How can amount of solar radiations falling on a tilted flat surface be estimated? [7M]

3. Discuss the performance analysis of Liquid flat plate collectors in detail. [14M]

4. a) List out various maximum power point techniques. Differentiate between perturb and observe (P&O) technique and Hill climbing technique. [7M]
    b) Discuss about advantages and limitations of Solar PV Energy conversion. [7M]

5. a) Give the classification of wind turbines on the basis of axis of rotation, size of machine and applications. [7M]
    b) Derive the expression for maximum power development due to wind. [7M]

6. a) State the basic principle of tidal energy production and write major components of tidal power plant. [7M]
    b) Derive the expression for energy and power in a single basin tidal system. [7M]

7. a) Describe the principle of working of a fuel cell with reference to H_2–O_2 cell. [7M]
    b) Discuss the difficulties in the large scale utilization of geothermal energy. [7M]

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PART –A
(14 Marks)

1.	a)	Mention any two applications of solar energy.	[2M]
	b)	Why orientation is needed in concentrating type collectors?	[2M]
	c)	List out the methods to improve solar cell efficiency.	[2M]
	d)	Explain the significance of Cp-λ curves.	[3M]
	e)	What are the different modes of operation of a tidal power plant?	[3M]
	f)	List out various types of Geothermal resources.	[2M]

PART –B
(56 Marks)

2.	a)	Explain why it is necessary to develop non-conventional method of generating electrical energy?	[7M]
	b)	Calculate the sun's altitude angle and azimuth angle at 7.30 am solar time on August 1st for a location at 40^0 north latitude.	[7M]
3.	a)	What are the types of collectors used in solar power generation? Briefly explain any two.	[7M]
	b)	Explain the operation of solar thermal plants with a neat sketch.	[7M]
4.	a)	What is the principle of solar photovoltaic power generation? What are the main elements of a PV system?	[7M]
	b)	Draw and explain an equivalent circuit of a practical solar PV cell.	[7M]
5.		Explain a typical wind farm by means of single line diagram. State the function of equipment in WECS.	[14M]
6.	a)	What is the source of tidal energy? What is the minimum tidal range required for a practical tidal plant? How much is the potential in tides?	[7M]
	b)	With the help of a neat diagram, explain the layout of a typical micro hydro plant.	[7M]
7.	a)	What are biomass conversion technologies? Draw a schematic diagram to explain various conversion technologies and products.	[7M]
	b)	What is a fuel cell? Discuss its operating characteristics.	[7M]

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PART –A   (14 Marks)

1.	a)	Define solar constant.	[2M]
	b)	Write a short note on solar still.	[3M]
	c)	What is the significance of fill factor?	[2M]
	d)	What is meant by pitch control of WECS?	[2M]
	e)	List out various types of turbines considered for use in micro hydro resources?	[3M]
	f)	Draw the operating characteristics of Fuel cell.	[2M]

PART –B   (56 Marks)

2.	a)	Discuss energy requirement of rural consumers and state the possible alternative sources of energy to meet the demand.	[7M]
	b)	Determine the local solar time and declination at a location Latitude 23 degree and 15 minutes North, Longitude 77 degree 30 minute East at 13.30 IST on June 19th. Equation of time correction is given from standard table = - (1'01").	[7M]
3.	a)	Enumerate the different types of concentrating type collectors.	[7M]
	b)	How the collection of solar energy does affected by tilting a flat plate collector with respect to ground?	[7M]
4.		What are the various Maximum power point techniques? Explain in detail about Perturb and observe (P&O) technique along with flow chart.	[14M]
5.	a)	Discuss the importance of wind energy sources and potentials with their significance.	[7M]
	b)	Discuss in detail the operation and control of a wind turbine.	[7M]
6.	a)	Explain with neat sketch, the methods of operation of tidal power generation.	[7M]
	b)	Describe the different types of turbines in use for small scale hydroelectric Power Plants.	[7M]
7.	a)	List various processes of Energy Conversion from Biomass. Explain any one process	[7M]
	b)	What is geothermal energy? Explain how geothermal energy can be utilized for electric power generation?	[7M]

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PART –A   (14 Marks)

1. a) Define solar radiation. [2M]

    b) Define heat removal factor and write the expression for it. [3M]

    c) List out the test specifications for PV systems. [2M]

    d) Write a short note on Betz criterion. [2M]

    e) Give a classification of small hydro power plants. [3M]

    f) List various processes of Energy Conversion from Biomass. [2M]

PART –B   (56 Marks)

2. a) Discuss about beam and diffuse radiation. Discuss about solar constant. [7M]
    b) Define various angles that are useful in solar radiation data-analysis along with their expressions. [7M]

3. a) What are the main components of a flat plate solar collector, explain the function of each component? [7M]
    b) What is a solar pond? What are the special arrangements made in solar pond to retain the heat energy content in Solar pond? [7M]

4. Discuss the design of a solar PV power plant in detail including sizing of solar array, solar panel tilt, energy storage etc. [14M]

5. a) Describe a wind energy conversion scheme. [7M]
    b) Discuss the significance of Tip–speed ratio. [7M]

6. a) State different configurations of tidal power generation schemes. Mention the advantages and limitations. [7M]
    b) List out various components of a tidal plant. What is the effect of pumping on the output of the tidal plant? [7M]

7. a) Classify various types of fuel cells. Describe the principle of working of a fuel cell with reference to H_2-O_2 fuel cell. [7M]
    b) Discuss the energy analysis of a hot Aquifer type Geothermal resource. [7M]

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