Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3161914 Date: 28-05-2025

Subject Name: Renewable Energy Engineering

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1*	**(a)**	What are the major advantages of renewable energy over conventional energy sources, and how can these benefits address India's energy security concerns?	**03**
	(b)	What are the limitations and challenges associated with renewable energy sources in India, particularly in terms of technological, geographical, and infrastructural constraints?	**04**
	(c)	Define the following terms: Solstice, Solar Path, Altitude angle, Zenith angle, Hour angle, Declination, Latitude angle.	**07**
Q.2	**(a)**	What are the different types of solar cells commonly used today, and how do they differ in terms of materials and efficiency?	**03**
	(b)	With neat sketch explain construction and working of Pyranometer.	**04**
	(c)	Describe the structure and working of an evacuated tube solar air heater. How does the evacuated design enhance its performance?	**07**
		OR	
	(c)	Explain methods of improving thermal performance of box type solar cookers.	**07**
Q.3	**(a)**	What are the advantages of MHD power generation over conventional thermal power generation methods?	**03**
	(b)	What are functions of yaw control and pitch control mechanisms in wind turbine?	**04**
	(c)	Derive an expression for maximum power, maximum torque and maximum axial thrust available from a wind turbine from basic principles.	**07**
		OR	
Q.3	**(a)**	What is Magnetohydrodynamic (MHD) power generation, and what is the basic principle behind its operation?	**03**
	(b)	Exemplify performance characteristics of Wind Machines.	**04**
	(c)	Define following terms: Cut-In Speed, Cut out speed, Tip-Speed Ratio, Betz Limit, Power Coefficient, Blade Pitch Angle, Aspect Ratio, Angle of Attack	**07**
Q.4	**(a)**	Enlist different types of wave energy conversion devices, and explain any one with neat diagram.	**03**
	(b)	What are hot dry rock resources and magma resources, and how are they utilized in geothermal energy?	**04**
	(c)	Discuss the key factors to consider when designing a biogas plant, such as feedstock type, plant size, and geographical location. How do these factors impact plant performance?	**07**
		OR	

Q.4	**(a)**	What is wave energy, and how is it generated? Describe the factors that influence wave energy potential.	**03**
	(b)	With neat sketch explain the construction and working of up- draft gasifies with its design considerations	**04**
	(c)	Define geothermal energy and describe various types of geothermal resources.	**07**
Q.5	**(a)**	Explain the difference between single-basin and double-basin tidal power plants. How does each type function?	**03**
	(b)	Define following terms: Life Cycle Cost Analysis (LCCA), Carbon Footprint, Renewable Energy Credits (RECs), Social Cost of Carbon	**04**
	(c)	Define the Clean Development Mechanism (CDM) and explain its role in supporting renewable energy projects, Explain the process of obtaining CDM credits for a solar project.	**07**

OR

Q.5	**(a)**	What are the advantages and limitations of a hybrid-cycle OTEC system compared to open- and closed-cycle systems?	**03**
	(b)	Define following terms: Payback Period , Return on Investment (ROI), Net Present Value (NPV), Internal Rate of Return (IRR)	**04**
	(c)	How does the Clean Development Mechanism contribute to the economic analysis of solar energy projects, also discuss the challenges and limitations of using the Clean Development Mechanism in solar energy projects.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161914 Date:22-05-2024

Subject Name:Renewable Energy Engineering

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Give advantages and limitations of renewable energy.	**03**
	(b)	Discuss in brief applications of solar cells.	**04**
	(c)	Explain construction and working of Pyrheliometer with a neat sketch.	**07**
Q.2	**(a)**	Explain terrestrial radiation.	**03**
	(b)	Explain working of Fresnel lens collector.	**04**
	(c)	Discuss effect of various parameters on performance of flat plate collector.	**07**
		OR	
	(c)	Give advantages and disadvantages of concentrating collectors over flat-plate type collectors.	**07**
Q.3	**(a)**	State the expression for hour angle and day length.	**03**
	(b)	Explain working of sunshine recorder.	**04**
	(c)	Write short note on: (i) Savonious rotor, (ii) Darrius rotor.	**07**
		OR	
Q.3	**(a)**	What is pitch control of wind turbine?	**03**
	(b)	Discuss site selection criteria for wind energy conversion system.	**04**
	(c)	Write a note on simple basin type solar still.	**07**
Q.4	**(a)**	Give detailed classification of wind mills.	**03**
	(b)	Explain working of Dolphin type wave energy converter.	**04**
	(c)	Discuss various factors affecting biogas generation.	**07**
		OR	
Q.4	**(a)**	Which are the main components of tidal power plants?	**03**
	(b)	Explain in brief Flexible bag type biogas plant.	**04**
	(c)	What is clean development mechanism? How it is useful for developing nations?	**07**
Q.5	**(a)**	What is the need for economic analysis of renewable energy system?	**03**
	(b)	Compare vapor dominated and liquid dominated geothermal plants.	**04**
	(c)	Discuss materials for MHD generators.	**07**
		OR	
Q.5	**(a)**	Define: 1.) Annual savings 2.) Cumulative savings 3.) Payback period	**03**
	(b)	How present worth can be calculated?	**04**
	(c)	State the principle of Ocean Thermal Energy Conversion (OTEC). Explain working of open cycle OTEC system.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2023

Subject Code:3161914 Date:12-07-2023

Subject Name:Renewable Energy Engineering

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define energy, energy science, and energy technology.	**03**
	(b)	Write detailed note on energy source in India.	**04**
	(c)	What is solar still? Discuss the working of basic type solar still with help of neat sketch also define efficiency of solar still.	**07**
Q.2	**(a)**	Explain lift and drag technology in wind power.	**03**
	(b)	Explain the concept of solar constant and air Mass.	**04**
	(c)	What is paraboloidal dish collector? Discuss its working with a neat sketch.	**07**
		OR	
	(c)	What are the main components of flat plate collector, explain functions of each.	**07**
Q.3	**(a)**	Explain spring tide and nappy tide.	**03**
	(b)	State advantages and disadvantages of solar thermal power plant over conventional thermal power plant.	**04**
	(c)	Discuss factors affecting bio gas production in detail.	**07**
		OR	
Q.3	**(a)**	Find diameter of wind turbine to generate power of 6 KW at wind speed of 9 m/s and rotor speed of 120 rpm. Assume power coefficient =0.4, mechanical transmission efficiency =0.9 and electrical transmission efficiency =0.9.	**03**
	(b)	Give comparison of horizontal and vertical axis wind mills.	**04**
	(c)	Discuss the working of parabolic cylinder collector.	**07**
Q.4	**(a)**	What are the causes of wind?	**03**
	(b)	Write advantages and disadvantages of wave energy.	**04**
	(c)	Discuss working of closed OTEC system with help of schematic diagram.	**07**
		OR	
Q.4	**(a)**	Why wind energy is preferred? State its advantages and disadvantages.	**03**
	(b)	Define term selling price, total cost and explain how break-even point can be calculated?	**04**
	(c)	Explain construction and working of horizontal axis wind generator with schematic diagram.	**07**
Q.5	**(a)**	Explain anaerobic digestion of biomass.	**03**
	(b)	State Faraday's Law? How it is used in MHD system?	**04**
	(c)	Write short note on Clean Development Mechanism.	**07**
		OR	
Q.5	**(a)**	Define (1) Annual Savings (2) Cumulative savings (3) Payback Period.	**03**
	(b)	In what form geothermal energy is obtained? State its merits and demerits.	**04**
	(c)	Explain with neat sketch open cycle MHD power plant.	**07**

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3161914 Date:08/06/2022

Subject Name:Renewable Energy Engineering

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Explain reserves, production and utilization of primary	**03**
	(b)	How can renewable energy benefit the environment?	**04**
	(c)	List instruments used for measurement of solar radiation intensity. Explain any one with neat sketch.	**07**
Q.2	**(a)**	Define terms : Declination, Solar constant, Angle of Incidence	**03**
	(b)	Describe solar dryer in detail.	**04**
	(c)	Define solar constant. Also explain spectrum distribution of terrestrial and extraterrestrial radiation at sea level with graph.	**07**
		OR	
	(c)	The latitude of Srinagar is $34^{0.}$ Find day length in hours when sunlight is available on 1st July.	**07**
Q.3	**(a)**	Explain basic operational principles of solar cell.	**03**
	(b)	Explain the different heat losses in Flat plate Collector	**04**
	(c)	Prove that the maximum turbine output can be achieved when Ve = Vi/3, Where Vi and Ve are upstream and downstream velocities of the wind.	**07**
		OR	
Q.3	**(a)**	Explain solidity, tip speed ratio and power co-efficient for wind mill	**03**
	(b)	Explain upward draft gasifier with diagram.	**04**
	(c)	Discuss problems in operating large wind power generation.	**07**
Q.4	**(a)**	List factors affecting production of biogas	**03**
	(b)	What is anaerobic digestion? Explain with neat sketch the three stage scheme for methane fermentation.	**04**
	(c)	Describe the working of floating drum type KVIC biogas plant with the help of neat sketch	**07**
		OR	
Q.4	**(a)**	Explain principle of MHD generation	**03**
	(b)	List the geothermal resources. Explain binary fluid hydrothermal system.	**04**

	(c)	Explain with sketches the various methods of tidal power generation. What are the limitations of each method?	**07**
Q.5	**(a)**	Draw neat sketches of Open and Closed cycle OTEC systems.	**03**
	(b)	Explain with neat sketch the vapour dominated geothermal system	**04**
	(c)	Explain return of investment (ROI)? Write down its limitation	**07**

OR

Q.5	**(a)**	What do you understand by spring and neap tides? How are they caused?	**03**
	(b)	Explain method of simple payback period. What are its limitations?	**04**
	(c)	With usual notations derive an expression for cumulative savings.	**07**

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