Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code:3161914 Date:21-11-2025

Subject Name:Renewable Energy Engineering

Time:02:30 PM TO 05:00 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 in brief about need of renewable energy.	**03**
	(b)	Explain advantages and limitations of renewable energy.	**04**
	(c)	Enlist different types of solar collectors and explain any one of them in detail.	**07**
Q.2	**(a)**	Write principle of solar cooker.	**03**
	(b)	Explain any one type of solar still with neat sketch.	**04**
	(c)	Write short note on solar refrigeration and air conditioning.	**07**
		OR	
	(c)	A single solar cell (10 cm × 10 cm) produces voltage of 0.5V and a current up to 2.5A. If the solar insolation is 800 W/m^2, Calculate efficiency of solar cell.	**07**
Q.3	**(a)**	State use of solar drier in storing agricultural products.	**03**
	(b)	Explain in brief about thermal energy storage.	**04**
	(c)	Write short note on photovoltaic system for power generation.	**07**
		OR	
Q.3	**(a)**	State use of energy available from wind.	**03**
	(b)	Write short note on wind energy potential and site selection.	**04**
	(c)	Explain in detail about safety and environmental aspects of wind energy potential.	**07**
Q.4	**(a)**	What is Biomass energy?	**03**
	(b)	Explain in brief about types and applications of gasifiers.	**04**
	(c)	Enlist different factors affecting biogas generation. Explain any one in detail.	**07**
		OR	
Q.4	**(a)**	State advantages and limitations of biomass energy.	**03**
	(b)	Explain in short about energy available from sea tides.	**04**
	(c)	Write short note on MHD power generation.	**07**
Q.5	**(a)**	State different wave energy conversion devices.	**03**
	(b)	Explain in brief about concept of geothermal energy.	**04**
	(c)	Write short note on economic analysis of solar system.	**07**
		OR	
Q.5	**(a)**	Define term time value of money.	**03**
	(b)	Explain in brief about how present worth can be calculated.	**04**
	(c)	Enlist types of biogas plants. Explain anyone them with neat sketch.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161914 Date:02-12-2024

Subject Name:Renewable Energy Engineering

Time:02:30 PM TO 05:00 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)	Explain the adoption of renewable energy sources contribute to India.	**03**
	(b)	Define (1) Direct radiation (2) Diffuse radiation (3) Global radiation (4) Longitude	**04**
	(c)	What is Solar Air heater? Explain different types of Solar Air heaters.	**07**
Q.2	(a)	How does wind energy contribute to reducing greenhouse gas emissions and combating climate change?	**03**
	(b)	Explain the difference between Pyranometer and Pyrheliometer.	**04**
	(c)	Explain the Solar Refrigeration system with neat sketch.	**07**
		OR	
	(c)	Explain the working principle of a Solar Air conditioning system with the help of a labeled sketch.	**07**
Q.3	(a)	Define (1) Solidity of turbine (2) Tip speed ratio (3) Angle of attack	**03**
	(b)	Differentiate Line Focusing and Point Focusing type solar collectors.	**04**
	(c)	Explain the Floating Drum Biogas Plant.	**07**
		OR	
Q.3	(a)	Discuss the various factors for site selection to establish wind power plant.	**03**
	(b)	What is solar still? Explain Single stage single basin solar still with sketch.	**04**
	(c)	What is Biogas? Explain different factors affecting the performance of Biogas generation.	**07**
Q.4	(a)	What is wind? Classify various wind mills.	**03**
	(b)	Differentiate Vapour dominated and Liquid dominated plants for Geothermal energy.	**04**
	(c)	Describe the construction and working of Ocean thermal energy conversion (OTEC) system based on closed cycle with help of schematic diagram.	**07**
		OR	
Q.4	(a)	Differentiate Horizontal axis wind turbine and Vertical axis wind turbine.	**03**
	(b)	Explain the Tidal power plant with double basin system.	**04**
	(c)	Write the advantages of Geothermal Energy. Explain Hot dry rocks (HDR) resources.	**07**
Q.5	(a)	Define (1) solar furnace (2) heliostat (3) solar photovoltaic system	**03**
	(b)	Explain time value of money and payback period.	**04**
	(c)	Explain clean development mechanism.	**07**
		OR	
Q.5	(a)	Define (1) evacuated tube collector (2) solar dryer (3) solar pond	**03**
	(b)	Explain Torque and Power coefficient in context with wind energy.	**04**
	(c)	Explain economic analysis of solar system.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161914 Date:11-12-2023

Subject Name:Renewable Energy Engineering

Time:02:30 PM TO 05:00 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 brief present scenario of conventional and renewable energy sources in India.	**03**
	(b)	Explain the following terms with neat sketches: Air Mass, solar azimuth, Hour angle, solar altitude.	**04**
	(c)	Explain construction and working of Pyrheliometer with a neat sketch.	**07**
Q.2	**(a)**	Explain basic operational principles of solar cell.	**03**
	(b)	Explain working of solar still with neat sketch.	**04**
	(c)	What are the main components of flat plate Collector ? Explain the working of a liquid flat Plate Collector	**07**
		OR	
	(c)	Define Sun rise Hour Angle and Declination Angle also calculate the day length in Ahmedabad (23^0 N) on 22^{nd} December.	**07**
Q.3	**(a)**	List the basic component of wind mill and draw the wind energy conservation system.	**03**
	(b)	Explain importance of drag and lift force in wind power generation.	**04**
	(c)	Prove that in case of Horizontal Axis Wind Turbine maximum power can develop when exit velocity = 1/3 of wind velocity and Pmax = 8 * (ρAVi^3 / 27)	**07**
		OR	
Q.3	**(a)**	Explain solidity, tip speed ratio and power co-efficient for wind mill	**03**
	(b)	Describe the Biomass conversion technologies.	**04**
	(c)	Explain Construction & working of Floating drum type biogas plant with neat sketch	**07**
Q.4	**(a)**	Write a short note on any one wave energy conversion devices.	**03**
	(b)	Draw neat sketches of Open and Closed cycle OTEC systems.	**04**
	(c)	Explain with sketches the various methods of tidal power generation What are the limitations of each method ?	**07**
		OR	
Q.4	**(a)**	Explain principle of OTEC.	**03**
	(b)	Explain basic principle of Magneto Hydro Dynamic generation.	**04**

	(c)	What are the advantages and applications of geothermal energy. Explain with neat sketch the vapour dominated geothermal system.	**07**
Q.5	**(a)**	Define: Net present value, Internal rate of return, Return on Investment	**03**
	(b)	Explain method of simple payback period. What are its limitations?	**04**
	(c)	What are solar ponds? Discuss the working of a solar pond with help of a neat sketch.	**07**

OR

Q.5	**(a)**	What is present worth? How it can be calculated?	**03**
	(b)	Explain initial and annual cost for renewable energy system.	**04**
	(c)	Write a short note on clean development mechanisms	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161914 Date:16-12-2022

Subject Name:Renewable Energy Engineering

Time:02:30 PM TO 05:00 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)**	Justify the need to explore Renewable energy in the context of the latest energy generation and energy consumption data for India	**03**
	(b)	Explain the following terms : i) Air mass ii) Solar constant iii) Angle of incidence iv) Hour Angle	**04**
	(c)	Derive an expression for maximum power, maximum torque, and maximum torque, and maximum axial thrust available from a wind turbine from basic principles	**07**
Q.2	**(a)**	Explain the working principle of solar photovoltaic cell	**03**
	(b)	Calculate the number of daylight hours in New Delhi on 22 December 2021. Take latitude as $28^0 35'$ N	**04**
	(c)	Explain with a neat sketch, the principle, construction, and working of the Pyranometer.	**07**
		OR	
	(c)	Explain in detail the parameters affecting the performance of solar thermal devices.	**07**
Q.3	**(a)**	Define the following terms: i) Tip Speed Ratio ii) Solidity iii) Torque coefficient	**03**
	(b)	Explain the concept of lift and drag in context to the wind turbine blade.	**04**
	(c)	Explain with a neat sketch, the construction, and working of floating drum biogas plants	**07**
		OR	
Q.3	**(a)**	Calculate the ideal power developed by a wind turbine with a rotor diameter of 25 m and velocity of 4 m/s. Find the ideal power if velocity is doubled. Comment on the result.	**03**
	(b)	Explain the following components of wind turbine mentioning its function i) Nacelle ii) Yaw Control Mechanism iii)Pitch Control Mechanism	**04**
	(c)	Classify gasifiers and explain at least one gasifier with a neat sketch	**07**
Q.4	**(a)**	Justify the need for solar energy storage and enlist different energy storage methods	**03**
	(b)	Explain the concept and working principle of MHD	**04**
	(c)	Write a short note on any two wave energy conversion devices.	**07**

OR

Q.4 **(a)** Explain the concept of Evacuated tube collector **03**

(b) Explain hot dry rock geothermal energy. **04**

(c) State the principle of Ocean Thermal Energy Conversion (OTEC). Explain the working of the closed-cycle OTEC system. **07**

Q.5 **(a)** Define: **03**

i) Cumulative Savings
ii) Life cycle savings
iii) Payback period

(b) Explain the working of the Solar Cooker. **04**

(c) A solar hot water system has an array of flat-plate collectors with an area of 50 m^2 installed in a factory. It costs Rs.25000/- and is set up with an initial down payment of 20 % of the investment, the balance of 80 % is taken as a soft loan to be repaid in equal installments over 5 years at an interest rate of 5%. The cost of conventional fuel saved in the 1st year is Rs 50000 and this cost increases with a rate of 5 % every year. The annual expenditure required is Rs20000/- in the 1st year and this expense increases by 5% every year. Tax deductions are permissible only on depreciation, which is allowed at the rate of 25 % each year, and the company tax rate is 30%. Assuming that the cost of an equivalent conventional energy system is Rs 25000 and that the market discount rate is 10 %. Calculate the CS over 15 years. Also, calculate the payback period with and without discounting. **07**

OR

Q.5 **(a)** Calculate the annual cost of a solar energy system with the characteristics tabulated below. **03**

Factor	Specification
Expected system lifetime t (Yr.)	20
Discount rate (%)	8
Collector area Ac (m2)	20
Collector cost (Rs/ m2)	100
Storage cost (Rs/ m2)	6.25
Cost of control system (Rs.)	100
Miscellaneous cost (Rs.)	200+(5 Ac)
Capital recovery factor for 20 years at 8 %	0.102

(b) Enlist various approaches to using solar energy for refrigeration and explain any one of them. **04**

(c) Write a short note on clean development mechanisms **07**

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