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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