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**MTECH**  
**(SEM I) THEORY EXAMINATION 2025-26**  
**RENEWABLE ENERGY SYSTEM**

TIME: 3 HRS

M.MARKS: 70

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

**SECTION A**

**1. Attempt all questions in brief.**

**02 x 7 = 14**

Q. No.	Question
a.	Differentiate between Non-conventional and Non-renewable energy resources with one example of each.
b.	Briefly describe the Environmental impacts of conventional energy usage.
c.	List four common applications of Solar energy utilization besides power generation.
d.	What is a Hydrum (Hydraulic Ram Pump)? State its working principle.
e.	Define Biogas and mention the primary biomass conversion technology used to produce it.
f.	Differentiate between Horizontal Axis Wind Mills (HAWT) and Vertical Axis Wind Mills (VAWT).
g.	State the Concept of integration of energy systems.

**SECTION B**

**2. Attempt any three of the following:**

**07 x 3 = 21**

a.	Explain the design and working of a Solar Refrigeration and Air-conditioning system. Discuss its economic viability compared to conventional systems.
b.	Describe the importance of Resource Assessment for Micro and Small Hydro Power. Explain the working of a Velocity Head Turbine.
c.	Discuss the various Biomass conversion technologies (e.g., combustion, pyrolysis, gasification). Detail the production of Producer Gas from biomass.
d.	A wind turbine is installed at a site where the wind speed is 8 m/s. The rotor diameter is 15 m. Assuming the air density to be 1.225 kg/m <sup>3</sup> and a coefficient of performance (C <sub>p</sub> ) of 0.4, calculate the power generated by the wind mill. (Numerical)
e.	Explain the Basic concepts of Heat and Fluid Flow (e.g., heat transfer modes, fluid resistance) that are useful for understanding and designing renewable energy systems.

**SECTION C**

**3. Attempt any one part of the following:**

**07 x 1 = 07**

a.	Explain the process of Solar Energy Collection, Storage, and Utilization in a Solar Water Heating system. Discuss the factors influencing the efficiency of solar collectors.
b.	What is Solar Radiation Data? Explain the various terms used to quantify solar radiation (e.g., Direct, Diffuse, Global radiation) and their importance in system design.

**4. Attempt any one part of the following:**

**07 x 1 = 07**

a.	Describe the resource potential and working of Tidal Power. Compare its advantages and disadvantages with Small Hydro Power Systems.
b.	Explain the function and design of Special Engines for Low Heads used in micro-hydro applications. Discuss the role of a Pump as Turbine (PAT) in these systems.

**5. Attempt any one part of the following:**

**07 x 1 = 07**

a.	Describe the process for obtaining Power Alcohol from Biomass. Discuss the necessary internal engine modifications and the resulting performance changes when using alcohol as fuel.
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b.	Discuss the Availability of Biomass from sources like agro, forest, animal, municipal and other residues. Explain the economic factors influencing the selection of biomass feedstocks for power generation.
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**6. Attempt any one part of the following: 07 x 1 = 07**

a.	With the help of suitable diagrams, explain the construction and working of a Horizontal Axis Wind Mill. Describe the key factors considered in the design and establishment of a Wind Farm.
b.	Discuss the Economics of Wind Energy. Analyze the financial parameters (e.g., capital cost, O&M cost, life cycle cost) that determine the viability of a wind energy system.

**7. Attempt any one part of the following: 07 x 1 = 07**

a.	Explain the Concept of Integrated Energy Systems with a suitable example (e.g., Solar-Wind Hybrid System). Describe the key steps involved in the design and economics of such a system.
b.	Discuss the global and national context of Energy and Development. Analyze the current status of Energy Demand and Availability and the factors contributing to the Energy Crisis.

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