Time: 3hrs. **Total Marks: 80**

N.B.: (1) Question No.1 is **Compulsory**.
(2) Attempt any **THREE** from question No.2 to 6.
(3) Use illustrative diagrams whenever possible.
(4) Assume suitable data if necessary and mention it clearly.

Q1) Solve any **Five** 20
a) State the various direct applications of solar energy.
b) Factors affecting the biogas production
c) Present status of power generation of India
d) Define Slope, Zenith angle, Surface azimuth angle, Air mass
e) What is geothermal energy? State its limitations
f) State and explain methods of hydrogen production technologies.

Q2) a) What is importance of renewable energy sources? What is the present energy scenario in India? 10
b) Estimate the monthly average daily global radiation on a horizontal surface at Vadodara (22°00°N, 73°10°E) during the month of March; If the average sunshine hour per day is 9.5. (Take values a=0.28 and b=0.48). 10

Q3) a) What is Betz coefficient? Show that the ideal maximum theoretical efficiency is 59% for a horizontal axis wind mill. 10
b) Explain the construction details and working of KVIC biogas digester. 10

Q4) a) Following observation were recorded from a test on Biogas system: 10
Calorific value of methane: 28.5MJ/m^3, Burner efficiency: 60%, Number of Cows: 8, Retention period: 20 days, Temperature of fermentation: 30°C, Dry matter collected per cow per day: 2kg, Density of dry matter in the fluid in the digester: 50kg/m^3, Biogas yield: 0.2m^3 per kg of dry input, Methane proportion in the biogas: 0.7, Determine volume of digester and power available from biogas digester.
b) How is Geothermal energy tapped? Enumerate problems in tapping. 10

Q5) a) Explain single and double basin tidal power plants with neat sketches. 10
b) What are the effects of various parameters on performance of Flat Plate Collector? 10

Q6) a) Explain with neat sketch Wind Energy conversion system. Classify Windmills. 10
b) Classify the different types of Concentrating solar collectors. Explain any one with schematic diagram. 10

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