

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 Attempt any **Four** Questions 20
- What is difference between Pyrheliometer and Pyranometer?
 - What are the advantages and disadvantages of fuel cell?
 - Differentiate between horizontal axis and vertical axis wind turbines.
 - Describe in brief a community type biogas plant.
 - State and explain methods of hydrogen production technologies.
 - What are advantages and limitations of wave energy conversion?
- Q2 a) Define and explain the following: 10
- Latitude
 - Declination
 - Surface azimuth angle
 - Hour angle
 - Day length
- b) What is the importance of Non-Conventional Energy Sources in the context of present energy scenario? 10
- Q3 a) Estimate the monthly average daily global radiation on a horizontal surface at Vadodara ($22^{\circ}00'N, 73^{\circ}10'E$) during the month of March if the average sunshine hours per day is 9.5. Take $a=0.28$, $b=0.48$. 10
- b) Explain energy status of India and Maharashtra and role of Non-Conventional Energy Sources. 10
- Q4 a) What is Betz Coefficient? Show that the ideal maximum theoretical efficiency (or the maximum power coefficient) is 59% for a horizontal axis windmill. 10
- 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) Explain in detail classification of biogas plants and their construction, principle of working. Discuss various factors which affect performance of biogas plant. 10
- Q6 a) Calculate the following parameters of a bio-gas system: 10
- The volume of biogas digester
 - The power available from bio-digester
- Given- Calorific value of methane: 28MJ/m^3 , Burner efficiency: 70%, Number of cows: 8, Retention period: 20 days, Temperature of fermentation: 30°C , Dry matter (cow dung) collected per cow per day: 2kg, Density of dry matter in the fluid (slurry) in the digester: 50kg/m^3 , Biogas yield: 0.2m^3 per kg of dry input, Methane proportion in the biogas: 0.7.
- b) Explain with neat sketch Wind Energy conversion system. Classify Windmills. 10