

M. Tech. Heat Power Engineering (CBCS Pattern) Sem-III
PHPS31 - Solar and Wind Energy Utilization

P. Pages : 1

Time : Three Hours



GUG/W/22/11054

Max. Marks : 70

- Notes :
1. All questions carry equal marks.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.
 4. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
 5. Discuss the reaction, mechanism wherever necessary.
 6. Solve **any five** questions.

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| 1. | a) Explain Solar Radiation Geometry (Angles) with the help of a neat sketch. | 4 |
| | b) Write short note on "Utility of Solar Energy" in future. | 5 |
| | c) Calculate the sunset hour angle & day length at a location latitude of 35°N on Feb. 14. | 5 |
| 2. | a) Explain the Tracking systems of a parabolic dish collector? | 4 |
| | b) Explain with neat sketch solar air heater. | 4 |
| | c) A photovoltaic cell has an open circuit voltage of 0.6 V & a short circuit current of 250 A / m ² at a cell temperature of 45°C. Calculate the voltage & current density that maximises the power of the cell. What would be the corresponding maximum power output per unit cell area? | 6 |
| 3. | a) Determine the average value of solar radiation on horizontal surface for July 12, at Nagpur (21° 06'N) if the average sunshine hours per day are 9.8. Assume a = 0.29, b = 0.55 | 6 |
| | b) Explain various characteristics of a solar cell. | 4 |
| | c) Explain the concept of green house? What are the advantages & limitations of solar furnaces. | 4 |
| 4. | a) Derive an expression for maximum power developed by wind mill. | 7 |
| | b) Explain the various technical terms related with wind turbine generator units. | 4 |
| | c) Explain the nature of atmospheric wind. | 3 |
| 5. | a) Calculate the Local Apparent – time corresponding to 1500 hours Indian standard time on 2 nd August. | 6 |
| | b) Describe the design consideration of horizontal axis wind machines. | 8 |
| 6. | a) Explain the effect of tilt angle on the performance of a liquid flat plate collector. | 6 |
| | b) What are the basic components of wind energy conversion system (WECS)? Explain with neat sketch. | 8 |
| 7. | a) Explain the theoretical variation of power coeff. With tip – speed – ratio. | 7 |
| | b) Explain in brief site selection for wind energy conversion system (WECS). | 7 |
| 8. | Write short notes on any three . | 14 |
| | a) Characteristics of savonious rotor. | b) Blade design for wind mill. |
| | c) Sensible heat storage system. | d) Cost of wind power competitive with conventional power plants. |
