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Question Paper Code : 21825

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015

Sixth Semester

Mechanical Engineering

ME 2023/ME 603/10122 MEE 14 – RENEWABLE SOURCES OF ENERGY

(Regulations 2008/2010)

(Common to PTME 2023 – Renewable sources of energy for B.E. (Part-Time) Sixth Semester – Mechanical Engineering – Regulations 2009)

Time : Three hours

Maximum : 100 marks

Use of standard charts and tables are allowed.

Any missing data can be suitably assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why Solar Tracking is essential in Concentrating Type Solar Collectors?
2. Define solar insulation.
3. What is meant by Cut-in and Cut-out speed in wind turbine?
4. Specify the need of pitch regulation in Wind Turbine?
5. Why Biomass is considered as a renewable energy source?
6. List the various contents of Biogas.
7. What type of turbine is used in Tidal power plant?
8. Mention the advantages of Small Scale Hydro Electric Power Plant.
9. List the various types of Fuel Cells.
10. Write the Electrolysis equation to produce Hydrogen from Water.

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PART B — (5 × 16 = 80 marks)

11. (a) (i) Specify the three types of Solar PV Cells. Also compare the conversion efficiency, Cost and space requirement to install with respect to each other. (8)
- (ii) A tannery industry plan to evaporate 1200 Litres of water per day from the liquid effluent discharged by installing solar still. A solar still with 30% efficiency will evaporate 27 Litres of effluent water per day per square meter. The daily solar radiation is 1000Watts/Square meter. The cost of solar still is Rs. 1200 for per square meter area. Calculate the area required to install the solar still. Also calculate the cost of solar still for the tannery industry. (8)

Or

- (b) (i) List the various types of Concentrating type solar collectors? Describe the solar collectors suitable for Solar Thermal power plant. (8)
- (ii) Explain the Solar Desalination process to produce distilled water from sea water with a schematic diagram. (8)
12. (a) (i) List the procedure to select a site for wind electric generator installation? (8)
- (ii) Calculate the Energy Generated by a 1MW wind turbine installed in a Location has the following Wind Energy frequency distribution data.

Wind speed in m/s	Less than 5	6	7	8	10	12	14	16	18	20	23	More than 25
Power in kW	0	103	193	308	595	874	1000	1000	1000	1000	1000	0
Hours in year	1600	400	500	900	1600	1000	760	500	500	400	200	400

(8)

Or

- (b) (i) Explain the working principle of wind energy system with a block diagram? (8)
- (ii) Calculate the generated electric power, when the wind speed is 8 meters per second for a horizontal axis three blade wind turbine machine having rotor blade diameter of 75 meter. The co-efficient of power activated in the wind turbine is 0.54. The Gear and Coupling Efficiency is 90%. The conversion efficiency of the generator is 92%. Assume wind density 1kg/cubic meter. Also calculate the power generated, when the wind speed is 16 meters per second. (8)

13. (a) (i) Explain the process of production of ethanol from molasses. (8)
- (ii) Compare the relative performance of Floating dome and Fixed dome type biogas plant. Also specify the advantages and limitations of the above. (8)

Or

- (b) (i) Explain the Anaerobic digestion principle to convert biomass into biogas? (8)
- (ii) Compare the Positive and Negative Factors of Biogas Production over Biomass Direct combustion to produce energy from Biomass. (8)
14. (a) (i) Explain the operation of Single bay type tidal power plant. Mention the limitations of Tidal plant. (8)
- (ii) Discuss the method of power generation from wave energy using TAPCHAN Technique? (8)

Or

- (b) (i) Explain the operation of Flash Steam type geothermal power plant with a block diagram? (8)
- (ii) Discuss the specific features of Small Scale Hydro Electric Power plant. Also mention the Turbine used for Small Scale Hydro Electric Power Plant. (8)
15. (a) (i) Describe the working principle of a fuel cell with reference to H₂-O₂ Cell. (8)
- (ii) List the various types of Hydrogen Energy Storage system. Also discuss the issues related to Hydrogen Storage. (8)

Or

- (b) (i) Specify the needs of energy storage devices? List the various method of energy storage? (8)
- (ii) Compare the Contrast between the Electrolysis process and Bio-Photolysis Process to generate Hydrogen for Fuel Cells. (8)