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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**Make-Up Examinations, July 2024**

**Semester**: 2023-24

**Course Code**: MEC 2001

**Course Name**: Renewable Energy Systems

**Program & Sem**: B. Tech& VI Sem

**Date**: 01 July 2024

**Time**: 9.30 am to 12.30 pm

**Max Marks**: 100

**Weightage**: 50%

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*

**Part A [Memory Recall Questions]**

**Answer any FIVE Questions. Each question carries 2 marks. (5Qx2M=10M)**

1. According to NASA, the rate at which solar energy arrives at the top of atmosphere is ………………….. [2M] (CO1, Knowledge Level)
2. The local Solar time (LST) is based on the definition of noon at a givem location as being the instant when the sun is at its highest position (greatest altitude above the horizon) in the sky. Is this true or false? [2M] (CO1, Knowledge Level)
3. The efficiency of OTEC systems is ………….  [2M] (CO1, Knowledge Level)
4. The gearbox is used in Wind turbine to ……………..the speed of generator shaft [2M] (CO1, Knowledge Level)
5. Ocean Thermal Energy Conversion system generates hydrogen as a clean fuel. Is this True or False? [2M] (CO1, Knowledge Level)
6. In the parabolic trough collector, the collector area is ………….times the absorber area [2M] (CO2, Knowledge Level)
7. Parabolic solar collector is ……… type collector. [2M] (CO1, Knowledge Level)

**Part B [Thought Provoking Questions]**

**Answer any FIVE the Questions. Each question carries 10 marks. (5Qx10M=50M)**

1. Define the following parameters. A) Declination angle, B) Elevation angle, C) Latitude angle. [10M] (CO3, Comprehension Level)
2. Write the advantages and disadvantages of vertical axis wind turbine? Also write the classification of wind turbine. [10M] (CO3, Comprehension Level)
3. Write the differences between Renewable energy resources and non-renewable energy resources. Also write few examples for renewable and non-renewable energy sources. [10M] (CO3, Comprehension Level)
4. Explain the working principle of parabolic trough collector along with neat sketch. [10M] (CO3, Comprehension Level)
5. Explain the working of Solar water heater with neat and clean diagram

[10M] (CO3, Comprehension Level)

1. Define the following parameters. A) Path of Sun B) Zenith Angle C) Average Solar Radiation [10M] (CO3, Comprehension Level)
2. Explain Azimuth Angle with neat and clean diagram. Discuss its effect when its value increases and decreases. [10M] (CO3, Comprehension Level)

**Part C [Problem Solving Questions]**

**Answer any TWO Questions. Each question carries 20 marks. (2Qx20M=40M)**

1. The following data are given for a biogas digester. Temperature 30°C, dry matter consumed per day = 8 kg, biogas yield is 0.25 m3 per kg. The efficiency of burner is 62%, methane proportion is 0.8. Heat of combustion of methane = 30 MJ/m3. Find the power available from the digester (W). Find the volume of biogas digester. [20M] (CO4, Application Level)
2. a). The latitude angle for a location is 20 N. Find the declination angle on May 20th, altitude angle and hour angle. [10M] (CO4, Application Level)

b). Find the collector efficiency and Transmittance-Absorptance product for the given data. Diffuse reflectance is 0.24, transmittance is 0.8, absorptance is 0.88, useful gain is 810 W/m2.hr, maximum solar radiation is 935 W/m2.hr. [10M] (CO4, Application Level)

1. The following data are given for a biogas digester. The retention time is 15 days, temperature 30°C, dry matter consumed per day = 12 kg, density of dry material in the fluid is 50 kg/m3. Biogas yield is 0.22 m3 per kg. The efficiency of burner is 60%, methane proportion is 0.8. Find the volume of the biogas digester (m3). Also calculate the power available from the digester.

 [20M] (CO4: Application Level)