CBCS SCHEME

USN

18ME651

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Non – Conventional Energy Sources

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Discuss the different Renewable Energy sources with special reference to Indian Context. **(10 Marks)**

b. Enlist the merits and demerits of any two Non – Conventional Energy sources. **(10 Marks)**

OR

2 a. With schematic representation, explain the Mechanism of Absorption , Scattering , Beam and diffuse radiation received at Earth's surface. **(10 Marks)**

b. Name the instruments used for Solar radiation measurement. Explain with sketch the working principle of Phyranometer and Sunshine recorder. **(10 Marks)**

Module-2

3 a. Discuss the following terms with sketch : i) Surface Azimuth angle
ii) Solar Azimuth angle iii) Solar Altitude angle. **(10 Marks)**

b. Write an expression for tilt factor of beam radiation when tilted surface facing South. **(04 Marks)**

c. At Nagapur the following observations were made :
Theoretical maximum possible sunshine hours = 9.5h ; Average measured length of day during April = 9.0h ; Solar radiation for a clear day ; $H_o = 2100$ kJ/m^2/day.
Constants : a = 0.27 , b = 0.5. Calculate the average daily global radiation. **(06 Marks)**

OR

4 a. Write the advantages and disadvantages of concentrating collectors over the flat plate type solar collectors. **(09 Marks)**

b. Describe the principle of working of Solar chimney power plant. **(06 Marks)**

c. Name the different types of Solar thermal collectors and explain the working of liquid flat plate Solar collector with sketch. **(10 Marks)**

Module-3

5 a. Discuss the top loss and bottom loss coefficients in a flat plate collectors with necessary equations. **(10 Marks)**

b. Use the following data to calculate the overall loss coefficient of a flat plate collector :
Size of the absorber plate = 2.15m × 1.15m ;
Spacing between absorber plate and 1st glass cover = 5cm ;
Spacing between 1st and 2nd glass cover = 5cm ; Glass cover Emissivity = 0.85 ;
Plate Emissivity = 0.90 ; Mean plate temperature = 25°C ; Ambient air temperature = 20°C
Collector tilt = 30°C ; Wind speed = 3m/s ; Back insulation thickness = 8cm ;
Side insulation thickness = 4cm ; Thermal conductivity of insulation = 0.035W/m-K ;
Stefan – Boltzmann constant = 5.67×10^{-8} W/m^2 – K^4.
Determine the overall loss coefficient. **(10 Marks)**

OR

6 a. Mention the four important applications of Solar photovoltaic system. **(04 Marks)**
b. Explain the Quantum Dot Solar Cell Technology. **(06 Marks)**
c. Write the classification of solar cells. Discuss the factors to be considered in solar cell design. **(10 Marks)**

Module-4

7 a. What are the most favorable sites for installing of wind turbine? **(04 Marks)**
b. Sketch and explain the diagram of HAWT. **(06 Marks)**
c. An Aero – generator generates an output of 1200 W at wind speed of 5m/s at one atmospheric pressure and a temperature of 20°C. What will be the output, if the same aero generator is installed on the top of the hill where temperature is 10°C , Pressure is 0.85 atmospheric and wind speed is 6m/s. **(10 Marks)**

OR

8 a. What are the problems associated with Tidal Energy? Explain the working of double basin Tidal Power plant. **(10 Marks)**
b. With the neat sketch, explain the working principle of OTEC (closed) plant. State the problems associated with OTEC. **(10 Marks)**

Module-5

9 a. State the Environmental problems associated with Geothermal Energy Conversion. **(04 Marks)**
b. Explain the factors affecting the Bio – gas generation. **(06 Marks)**
c. Sketch and explain KVIC bio gas plant. **(10 Marks)**

OR

10 a. What are the different methods for Hydrogen production? Explain Electrolysis process with sketch. **(10 Marks)**
b. Explain the following : **(10 Marks)**
i) Photo synthesis ii) Energy plantation.

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