

CBCS SCHEME

18ME651

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Sixth Semester B.E. Degree Examination, June/July 2023 Non-Conventional Energy Sources

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Enlist and explain the merits and demerits of any three non-conventional Energy Sources. (10 Marks)
- b. Explain Tar Sands and Oil shale as energy sources and mention their limitations. (10 Marks)

OR

- 2 a. With schematic representation, explain mechanism of absorption, scattering beam and diffuse radiation received at earth's surface. (10 Marks)
- b. Explain with a neat sketch, explain the working of pyrenometer. (05 Marks)
- c. Explain briefly the need for alternate energy sources. (05 Marks)

Module-2

- 3 a. Define the following term with respect to solar radiation:
i) Hour angle ii) Declination angle iii) Zenith angle iv) Latitude angle
v) Solar Azimuth angle. (10 Marks)
- b. Calculate the day length of location (latitude $22^{\circ} 00' W$, $73^{\circ} 10' E$) during the month of March 1. (05 Marks)
- c. With the usual expression for flux explain beam and diffuse radiation on a tilted surface. (05 Marks)

OR

- 4 a. With a neat sketch explain working of liquid flat-plate collector. (08 Marks)
- b. Describe solar pond for solar energy collection and storage. (07 Marks)
- c. Explain how solar energy can be used for drying with a neat sketch. (05 Marks)

Module-3

- 5 a. List and discuss the various parameters that affect the performance of collector. (10 Marks)
- b. Explain the heat transfer process in LFPc with neat sketch and write the energy balance equation, explaining each terminal. (10 Marks)

OR

- 6 a. Explain the working principle and I-V characteristics of a solar PV cell. (10 Marks)
- b. Define : i) Collector efficiency factor ii) Collector heat removal factor of LFPc write the expression for the above. (05 Marks)
- c. What are the applications of solar PV cell? (05 Marks)

Module-4

- 7 a. Describe the main consideration in selecting the site for wind generators. (10 Marks)

- b. Wind blows with a velocity of 15 m/s at 15°C and 1 std. atm. pressure. The turbine diameter is 120m with operating speed of 40 rpm at maximum efficiency. Propeller type wind turbine is considered. Calculate the following :
- Total power density in the wind stream
 - Maximum obtainable power density
 - Obtainable power density
 - Total power
 - Torque at max η
 - Maximum axial thrust
- Assume $R = 0.287 \text{ kJ/kgK}$, $\eta = 35\%$. (10 Marks)

OR

- 8 a. Explain with a sketch, the closed Rankine cycle OTEC system. (10 Marks)
 b. Explain briefly the harnessing of Tidal energy. (05 Marks)
 c. Explain the advantages and disadvantages of Tidal energy. (05 Marks)

Module-5

- 9 a. State the environmental problem associated with geothermal energy conversion. (05 Marks)
 b. List the factors affecting biogas generation. (05 Marks)
 c. Sketch and explain the working of a fixed dome type biogas plant used in India. (10 Marks)

OR

- 10 a. What are the different methods of hydrogen production? Describe electrolytic method of hydrogen production. (10 Marks)
 b. Briefly explain the safe utilization of hydrogen energy. (05 Marks)
 c. Describe various methods of storage of hydrogen. (05 Marks)
