Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (R), DECEMBER 2023

(2020 SCHEME)

Course Code : 20MET443

Course Name: Renewable Energy Engineering

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain the following terms related to solar geometry (i) Zenith angle and (ii) Solar azimuth angle
2. What are the renewable energy resources?
3. What is a solar pond?
4. List the difference between passive and active solar energy systems with neat sketches.
5. What do you mean by (i) Yaw control and (ii) Rated wind speed with respect to wind turbines?
6. List the main considerations in selecting a site for wind energy converters.
7. Write any two advantages and disadvantages of a tidal power plant.
8. List any four types of geothermal energy sources.
9. “Biomass can be considered as a form of solar energy”. Discuss this statement.
10. What are the advantages of using biomass as an energy source?

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) On January 12, 2024, at Pathamuttom (coordinates 9.5131° N, 76.5517° E), Calculate:
    i. The number of sunshine hours. (8)
    ii. The zenith angle of the sun at 2:30PM for a horizontal plane facing due south.

    b) With neat diagrams, explain the working of an instrument that uses beam radiation for solar radiation measurement. (6)

OR

12. What inferences can you make from the various angles mentioned in solar radiation geometry? Suffice your answer with suitable diagram. (14)

MODULE II

13. a) Explain any two applications which utilises solar energy. (8)
    b) Explain the construction and working of a solar photovoltaic cell. (6)

OR

14. Draw and explain the operation of flat plate collector. (14)

MODULE III

15. What is Betz's Law in the context of wind energy and how does it define the maximum achievable efficiency of a wind turbine's rotor? (14)

OR

16. With a neat diagram explain the construction and working of a horizontal axis type wind power system. (14)

MODULE IV

17. a) With a neat sketch explain the working of a liquid dominated geothermal power plant. (10)
    b) List the advantages and disadvantages of a tidal power plant. (4)

OR

18. With neat sketches explain the working principle of any two types of wave energy conversion device. (14)

MODULE V

19. Explain the construction and working of KVIC (floating type) bio gas plant. (14)

OR

20. a) Define (i) Payback time (ii) Return on investment (iii) Life cycle cost (6)

    b) A solar PV system consisting with two lamps, a battery and other associated components cost Rs. 55000. The cost of conventional energy saved due to its installation is Rs. 4000 in the first year and this cost inflates at the rate of 5 % per year. Assume discounting rate is 9%. Calculate the payback period of the system with and without discounting. (8)

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