Register No.: …… Name: ……..

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022

(Power Systems)

(2021 Scheme)

Course Code: **21PS104-A**

Course Name: **Green Energy Systems**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. List the advantages and limitations of conventional energy sources.
2. Draw the equivalent circuit of a Photovoltaic cell. Explain the physics involved behind photovoltaic generation.
3. Define Aerodynamic power coefficient. Explain its significance.
4. Justify the need for storage systems in wind-PV hybrid systems.
5. What is the working principle of ocean thermal energy conversion system?
6. Explain biomass gasification process.
7. Give the classification of geothermal resources.
8. Explain the importance of hydrogen energy storage system.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Illustrate the working principle of solar flat plate collectors with neat diagram. (6)

OR

10. A flat plate solar thermal collector is installed on the roof of Hotel Sunshine in New Delhi (Latitude Φ =28.35° N). The collector surface of 10 m^2 area is pointing towards south with angle of 30° with horizontal. Calculate the angle of incidence of sun light for first December at Local Apparent Time of 9 AM (corresponding hour angle ω = 45°). (6)

MODULE II

11. Describe stand-alone PV systems and grid connected PV systems with neat diagram (6)

OR

12. A house owner decides to use a solar PV system to run 2 CFLs (18 Watt each) and 2 fans (60 Watt each) for 6 hours per day. Design the stand-alone PV system assuming combined efficiency of inverter and battery to be 81% and sunlight available in a day to be 8 hours/day. Assume a battery voltage of 12V and depth of discharge of battery as 80%. (6)

MODULE III

13. Explain any three types of rotors used for wind power generation with neat diagram. (6)

OR

14. Prove that the maximum wind turbine output can be achieved when $V_d = 1/3\ V_u$, where V_d and V_u are down-stream and up-stream wind velocity respectively. (6)

MODULE IV

15. With a block diagram, explain how a wind energy system and solar energy system can be integrated. (6)

OR

16. Discuss the significance of wind-PV grid integrated system with proper illustrations. (6)

MODULE V

17. With neat diagram, explain the working principle of closed cycle OTEC system. (6)

OR

18. Illustrate and explain the working of a KVIC biogas plant. (6)

MODULE VI

19. Explain micro hydel electric systems with schematic diagram. (6)

OR

20. With a neat diagram, explain Vapour dominated geothermal power plants. (6)

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