Register No: ……………………   Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
FOURTH SEMESTER B.TECH DEGREE EXAMINATION(R), MAY 2024
Electrical and Electronics Engineering
(2020 SCHEME)

Course Code	:	**20EET298-B**
Course Name	:	**Physics of Renewable Energy Systems**
Max. Marks	:	**100** **Duration:3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. List the factors affecting energy resource development.

2. Distinguish between beam radiation and diffuse radiation.

3. What is 'Capacity Factor' of a wind power plant ? Write a mathematical expression for finding capacity factor.

4. Draw the power versus wind speed characteristics and explain different operating regions.

5. Draw the charge carrier distribution function (Fermi function) for extrinsic Si (P type and N type) for temperature greater than 0 K.

6. Explain the terms 'donors' and 'acceptors' in the case of an extrinsic semiconductor.

7. What are spring tides and neap tides ?

8. Draw the diagrams that represent surface particle motion and particle motion at various depths in water waves.

9. Define energy storage.

10. Explain the main features of a compressed air storage plant.

PART B
(Answer one full question from each module, each question carries 14 marks)
MODULE I

11. a) Explain how current scenario of India's energy consumption leads to the exploitation of renewable energy sources?   7
    b) Elaborate the availability and limitations of conventional sources of energy and its impact on human life. What are the alternate solutions?   7

OR

12. a) Write short notes on the advantages and disadvantages of any three types of non-conventional energy resources   9
    b) Define solar constant. Calculate the number of daylight hours in Srinagar for 22nd June. The latitude of Srinagar is 34º 05' N   5

MODULE II

13. (a) Explain the concept of lift and drag in a wind turbine. Give a detailed comparison of lift and drag type machines.   8

(b) Explain yaw control and pitch control in a wind turbine. 6

OR

14. (a) Plot the graph for variation of wind speed with height and explain the terms, 'wind shear', 8 'gradient height', 'planetary boundary layer', 'surface layer' and 'ekman layer'.
(b) Write and explain the mathematical expression for variation of wind speed with height and 6 specify the range of values of 'α' for varying ground roughness.

MODULE III

15. (a) Explain the generation of electron-hole pair by photon absorption. Elaborate further about 11 'Photoconduction'.
(b) Calculate the optimum wavelength of light for photovoltaic generation in a CdS cell. The band 3 gap for CdS is 2.42 eV.

OR

16. (a) Explain the formation of energy bands in a Si atom. 6
(b) Using neat diagrams, explain direct and indirect bandgap materials. 8

MODULE IV

17. (a) What are the major advantages and disadvantages of harnessing geothermal energy. 8
(b) Explain the two major classification of the applications of geothermal energy. 6

OR

18. Explain the four major biomass conversion technologies. 14

MODULE V

19. a) Explain the working principle of a fuel cell 7
b) Write short note on rechargeable batteries 7

OR

20. a) Illustrate the working principle of compressed air energy storage system 7
b) Explain flywheel energy storage system with diagram 7

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