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Question Paper Code	12828
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M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Second Semester

Power Electronics and Drives

20PPEEL212 - SOLAR AND ENERGY STORAGE SYSTEMS

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | Marks | K-
Level | CO |
|---|-------|-------------|-----|
| 1. List the types of semiconductor material. | 2 | K1 | CO1 |
| 2. Define the greenhouse effect. Name the greenhouse gases. | 2 | K1 | CO1 |
| 3. What are super capacitors? | 2 | K1 | CO2 |
| 4. What are the requirements for inverters used in stand-alone PV systems? | 2 | K1 | CO2 |
| 5. Describe economic issues involved in large, central generating PV plant. | 2 | K2 | CO3 |
| 6. List the benefits of 'Sunshine Projects' in Japan. | 2 | K1 | CO3 |
| 7. Tabulate the long term benefits of well penetrated distributed energy storage. | 2 | K1 | CO4 |
| 8. List the short-term benefits of distributed energy storage for utilities. | 2 | K1 | CO4 |
| 9. Describe direct – driven PV cell. | 2 | K1 | CO5 |
| 10. List the solar energy based direct drive applications. | 2 | K1 | CO5 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

- | | | | |
|---|----|----|-----|
| 11. a) Briefly explain the spectral response of solar cell. | 13 | K2 | CO1 |
| OR | | | |
| b) What is a PN Junction? How it's formed in a semiconductor material? Explain its characteristics. | 13 | K2 | CO1 |
| 12. a) Recommend suitable procedure and design standalone PV system. | 13 | K2 | CO2 |
| OR | | | |
| b) Explain in detail about the energy storage systems. | 13 | K2 | CO2 |
| 13. a) Describe the economic aspects of PV system. Explain how PV system is usually rated. | 13 | K2 | CO3 |

OR

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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- b) Describe with a neat sketch power conditioning unit of grid connected PV systems. 13 K2 CO3
14. a) Identify the Impacts of power plant cycling and explain with examples. 13 K2 CO4
- OR**
- b) Describe in detail about the solar thermal energy storage. 13 K2 CO4
15. a) Prepare and explain economics of Thermal Energy Storage Systems. 13 K2 CO5
- OR**
- b) Explain a quantitative comparison of four secondary battery systems. 13 K2 CO5

PART - C (1 × 15 = 15 Marks)

16. a) Identify the components and explain principle operation of pumped hydroelectric storage system in detail with neat diagram. 15 K3 CO4
- OR**
- b) Design the following for a solar car (i) Drive (ii) PV array size (iii) Controller (iv) Battery (v) Protection components. 15 K3 CO5