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Question Paper Code	12267
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**M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023**

Third Semester

**M.E. - Power Electronics and Drives**

**20PPEEL309 - ADVANCED ENERGY STORAGE TECHNOLOGY**

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |                                                                                            | <i>Marks,<br/>K-Level, CO</i> |
|--------------------------------------------------------------------------------------------|-------------------------------|
| 1. What is meant by energy demand?                                                         | <i>2,K2,CO1</i>               |
| 2. List out the alternative sources of energy.                                             | <i>2,K2,CO1</i>               |
| 3. What are the different energy transformations?                                          | <i>2,K1,CO2</i>               |
| 4. What is the importance of electrochemical energy?                                       | <i>2,K1,CO2</i>               |
| 5. Define Autonomy.                                                                        | <i>2,K1,CO3</i>               |
| 6. List the characteristics of energy storage systems.                                     | <i>2,K1,CO3</i>               |
| 7. Mention the hydrogen technical development methodologies.                               | <i>2,K2,CO4</i>               |
| 8. List the steps involved in the electrochemical extraction and purification of hydrogen. | <i>2,K1,CO4</i>               |
| 9. What are the types of lead-acid batteries?                                              | <i>2,K1,CO5</i>               |
| 10. What is meant by battery management system?                                            | <i>2,K2,CO5</i>               |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

- |                                                                                              |                  |
|----------------------------------------------------------------------------------------------|------------------|
| 11. a) Describe various types of energy storages with suitable examples.                     | <i>13,K2,CO1</i> |
| <b>OR</b>                                                                                    |                  |
| b) Describe the storage elements are classified and explain them in detail.                  | <i>13,K2,CO1</i> |
| 12. a) Explain the arrangement of the components of Pumped hydro storage with a neat sketch. | <i>13,K2,CO2</i> |
| <b>OR</b>                                                                                    |                  |
| b) Explain the working of Fuel cells, Hydrogen energy storage With neat sketch.              | <i>13,K2,CO2</i> |
| 13. a) Describe in detail environmental considerations, recycling and storage types.         | <i>13,K2,CO3</i> |

**OR**

b) Discuss investment cost Comparison of the storage systems. *13,K2,CO3*

14. a) Explain how the pressurized PEM water electrolysis process flows with a neat sketch. *13,K2,CO4*

**OR**

b) Describe about Series hybrid electric vehicle and its advantages and disadvantages. *13,K2,CO4*

15. a) Explain in detail about lithium batteries and their Applications. *13,K2,CO5*

**OR**

b) Explain with neat diagram of solar energy storage system. *13,K2,CO5*

**PART - C (1 × 15 = 15 Marks)**

16. a) Explain in detail about Charging Pattern Optimization for lead-acid Batteries. *15,K2,CO5*

**OR**

b) Discuss briefly each of the following: *7,K2,CO4*

(i) Hybrid Energy Storage.

(ii) Power management in storage devices at peak and continuous levels. *8,K2,CO4*