



**B.E. DEGREE EXAMINATIONS: NOV/DEC 2022**

(Regulation 2018)

Fifth Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

U1EEEE0010: Energy Storage Technology

**COURSE OUTCOMES**

- CO1:** Describe the charge, energy demand supply and issues  
**CO2:** understanding the materials used in modern storage devices  
**CO3:** Summarize the factors that control battery operational characteristics and the primary mechanisms  
**CO4:** Understanding the fuel cells, its application and need for storage of hybrid energy  
**CO5:** Describe the super capacitors and design parameters

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-  
PART A (10 x 2 = 20 Marks)  
(Answer not more than 40 words)**

- |     |  |     |                   |
|-----|--|-----|-------------------|
| 1.  | List the benefits of Energy storage.   | CO1 | [K <sub>1</sub> ] |
| 2.  | What causes transmission line congestion?  | CO1 | [K <sub>1</sub> ] |
| 3.  | List the various types of energy storage systems.  | CO2 | [K <sub>1</sub> ] |
| 4.  | Brief on the concept of flywheel.  | CO2 | [K <sub>2</sub> ] |
| 5.  | What are the most relevant parameters that define the storage devices?                         | CO3 | [K <sub>1</sub> ] |
| 6.  | What are the advantages and disadvantages of Energy Storage?                                   | CO3 | [K <sub>1</sub> ] |
| 7.  | Mention the various issues with Hydrogen based energy storage system                           | CO4 | [K <sub>2</sub> ] |
| 8.  | Draw the block diagram of hybrid energy generation system using combination of wind and solar. | CO4 | [K <sub>1</sub> ] |
| 9.  | List the advantages and disadvantages of flow battery energy storage systems.                  | CO5 | [K <sub>1</sub> ] |
| 10. | Write an expression for energy stored in a Super capacitor.                                    | CO5 | [K <sub>1</sub> ] |

**Answer any FIVE Questions:-  
PART B (5 x 16 = 80 Marks)  
(Answer not more than 400 words)**

- |     |    |   |    |     |                   |
|-----|----|---|----|-----|-------------------|
| 11. | a) | Explain the needs for energy storage system.  | 04 | CO1 | [K <sub>2</sub> ] |
|     | b) | Describe the variations in energy demand in detail with necessary sketch.                   | 12 | CO1 | [K <sub>2</sub> ] |
| 12. | a) | Summarize the advantages and disadvantages of a pumped Hydro system.                        | 04 | CO2 | [K <sub>2</sub> ] |
|     | b) | Describe the components and process of storage of energy in Superconducting Magnetic Energy | 12 | CO2 | [K <sub>2</sub> ] |

Storage.

- |     |    |  |    |     |                   |
|-----|----|--|----|-----|-------------------|
| 13. | a) | Describe a thermal energy storage technique with necessary sketch.                                     | 12 | CO2 | [K <sub>2</sub> ] |
|     | b) | Compare the environmental impacts for the following technologies                                       | 04 | CO2 | [K <sub>2</sub> ] |
|     |    | 1. Flywheels   |    |     |                   |
|     |    | 2. Batteries [Lead-Acid]   |    |     |                   |
| 14. | a) | List the performance parameters of battery energy storage system and explain with its characteristics. | 12 | CO3 | [K <sub>1</sub> ] |
|     | b) | Interpret the terms SOC, DOD and SOH with respect to batteries.  | 04 | CO3 | [K <sub>1</sub> ] |
| 15. | a) | List the methods of hydrogen generation and describe anyone technique.                                 | 12 | CO4 | [K <sub>2</sub> ] |
|     | b) | Explain the concept of regenerative power and capturing methods.                                       | 04 | CO4 | [K <sub>2</sub> ] |
| 16. | a) | Draw the structure of flow batteries and explain the mechanism involved in it.                         | 12 | CO5 | [K <sub>2</sub> ] |
|     | b) | List the applications of super capacitors  | 04 | CO5 | [K <sub>2</sub> ] |

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