



B.E DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Fifth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EEE0010: 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)

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|--|-----|-------------------|
| 1. State the importance of energy storage system. | CO1 | [K ₁] |
| 2. What are the causes of Transmission Congestion? | CO1 | [K ₁] |
| 3. Write the expression for stored energy in flywheel storage system. | CO2 | [K ₂] |
| 4. Mention the advantages of Super-conducting Magnetic Energy Storage System (SMES). | CO2 | [K ₂] |
| 5. Determine the service time of 1Ah battery with a C rate of C/5. | CO3 | [K ₂] |
| 6. Write the difference between primary batteries and secondary batteries. | CO3 | [K ₂] |
| 7. Name any two hydrogen storage techniques. | CO4 | [K ₁] |
| 8. List two examples of hybrid energy storage system. | CO4 | [K ₂] |
| 9. What are the applications of super capacitor? | CO5 | [K ₃] |
| 10. List the disadvantages of flow battery. | CO5 | [K ₁] |

Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

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| 11. a) Explain the causes of energy interruptions in detail and write the impacts of energy interruptions. | 10 | CO1 | [K ₂] |
| b) Summarize the environmental and sustainability issues in energy storage systems. | 6 | CO1 | [K ₂] |

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| 12. | a) | Name the components of Pumped Hydro Energy Storage System (PHESS) and describe the working of PHESS with neat diagram. Write any two PHESS installed in India with storage capacity. | 10 | CO2 | [K ₂] |
| | b) | Outline the spring powered energy storage system. | 6 | CO2 | [K ₂] |
| 13. | a) | State the importance of battery recycling. Describe the recycling process of lead acid battery. | 8 | CO3 | [K ₂] |
| | b) | Illustrate the charging and discharging cycle of electrochemical energy storage system with an example. | 8 | CO3 | [K ₃] |
| 14. | a) | Explain the various methods of hydrogen production. Describe the working of hydrogen fuel cell system with neat diagram. | 10 | CO4 | [K ₃] |
| | b) | Sketch and explain the block diagram of hybrid energy system combining solar PV and wind energy systems. | 6 | CO4 | [K ₃] |
| 15. | a) | Describe the operation of super capacitor with power calculation. | 8 | CO5 | [K ₃] |
| | b) | Illustrate the working of flow battery. | 8 | CO5 | [K ₂] |
| 16. | a) | Summarize the working of thermal energy storage system with molten salt as phase change material. | 6 | CO2 | [K ₂] |
| | b) | Explain the working of Compressed Air Energy Storage System (CAESS) and list the disadvantages of CAESS. | 10 | CO2 | [K ₂] |
