

No. of Printed Pages : 4

MRWE-002

**MASTER OF SCIENCE (RENEWABLE
ENERGY AND ENVIRONMENT)
(MSCRWEE)**

Term-End Examination

December, 2024

MRWE-002 : ENERGY STORAGE

Time : 3 Hours

Maximum Marks : 70

Note : Attempt any **seven** questions. All questions carry equal marks.

1. Distinguish between any *four* of the following :

2.5×4=10

- (a) Electrochemical and Photochemical storage
- (b) Mechanical bearing and Magnetic bearing
- (c) Lithium-ion battery and Lead acid battery
- (d) Solid oxide fuel cell and Molten carbonate fuel cell

A-64/MRWE-002

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- (e) Sensible heat storage and Latent heat storage
 - (f) Organic phase change material and Inorganic phase change material
2. (a) Explain the benefits and limitations of pumped hydroelectric storage.
- (b) Discuss the concept of smart grids and their relationship with energy storage technologies. 5+5=10
3. Describe the components of flywheel energy storage system. 10
4. (a) Discuss the concept of redox flow batteries and their advantages over other battery technologies.
- (b) Explain the reliability analysis of electro-chemical energy storage systems. 5+5=10
5. (a) Explain in brief various modes of hydrogen storage.

- (b) Discuss the role of hydrogen storage in the transition to a clean and sustainable energy system. $5+5=10$
6. (a) Discuss the major challenges associated with the widespread adoption of fuel cells.
- (b) Explain in brief the magnetic storage system. $5+5=10$
7. How does superconducting magnetic energy storage differ from other energy storage systems ? 10
8. (a) What factors need to be considered while designing phase change material ?
- (b) Explain the purpose of solar energy storage in a grid connected solar system. $5+5=10$
9. (a) Discuss the economic viability of implementing sensible heat storage systems.
- (b) What are the key considerations in designing latent heat energy storage system ? $5+5=10$

10. Write short notes on any *four* of the following :

2.5×4=10

- (a) Stefan problem
- (b) Greenhouse heating systems
- (c) Gas cooling
- (d) Cryogenically cooled refrigerator
- (e) Spintronics
- (f) Compressed air energy storage

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