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

(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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