



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:VI
Class:TY	Program:B.Tech
Branch Code:ELE	Pattern:2022
Name of Course:Renewable Energy Systems	Course Code:ELE223015A
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1a) Explain the working principle of a Geothermal Energy System with a suitable diagram. (6) CO1

Question No. 2

- 2a) Explain the following terms with an example: (6) CO1, CO3
- i) Mismatch in the cell
 - ii) Fill Factor

Question No. 3

- 3a) Analyze the social, economical, technical and operational limitations of biogas technology in rural India. (8) CO4

OR

- 3b) Explain the utilization of biogas produced from commercial-scale plants for power generation, heating, and other applications. Discuss the system layout with block diagram. (8) CO4
- 3c) Explain the process of biomass pyrolysis for the production of liquid fuels. Discuss the major reactions involved and the effect of temperature and heating rate on product yield. (8) CO2

OR

- 3d) Compare the performance of different types of updraft and downdraft gasifiers used in biomass gasification (8) CO2

Question No. 4

- 4a) Write the advantages and limitations of hydrogen storage in liquid form based on density, cost, handling safety, and suitability for large-scale usage parameters (8) CO4, CO5

OR

- 4b) Illustrate the role of hydrogen as a clean energy carrier. Analyze its significance in sector such as mobility (FCEV) (8) CO4, CO5
- 4c) Highlight the importance of hydrogen in the global energy transition. Define its applications and benefits in transportation, steel production, ammonia manufacturing, and renewable energy storage. (8) CO4, CO5

OR

- 4d) Describe the construction and operation of Solid Oxide electrolyze. Explain the electrochemical reactions involved in and compare their performance characteristics. (8) CO4, CO5

Question No. 5

- 5a) Compare PEMFC, AFC fuel cells based on electrolyte type, operating temperature, efficiency, fuel flexibility, start-up characteristics, cost, and major applications. Present a detailed parameter-wise analysis. (8) CO5, CO6

OR

- 5b) Analyze the V–I curve of a alkaline fuel cell to explain the regions of activation loss, ohmic loss, and mass transport loss. Discuss how these losses can be minimized in practical fuel cell systems (8) CO5, CO6
- 5c) Why is PEM fuel cell preferred for automotive applications? Give any four application-related reasons. (8) CO5, CO6

OR

- 5d) Explain the electrochemical reactions involved in a hydrogen fuel cell. Discuss how fuel cell performance varies with temperature, pressure, and type of electrolyte. (8) CO5, CO6

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