

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)



B. Tech (Eighth Semester - Regular) Examinations, April - 2026

22BELPE48011/22BEEPE48011 – Hydrogen Energy and Fuel Cell (EE & EEE)

Time: 3 hrs

Maximum: 70 Marks

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

- | | CO # | Blooms
Level |
|---|------|-----------------|
| a. Explain the primary methods used for hydrogen production. | CO1 | K2 |
| b. Describe the role of electrolysis in the production of green hydrogen. | CO2 | K2 |
| c. Explain what fuel cells are and how they differ from batteries. | CO3 | K2 |
| d. Interpret the meaning of stoichiometric coefficients in fuel cell reactions. | CO4 | K3 |
| e. Describe the benefits of using fuel cells in domestic power systems. | CO4 | K2 |

PART – B

(15 x 4 = 60 Marks)

Answer **ALL** the questions

- | | Marks | CO # | Blooms
Level |
|--|-------|------|-----------------|
| 2. a. Explain the concept of the hydrogen economy within the context of India. | 8 | CO1 | K2 |
| b. Describe the production, storage, and transportation systems of hydrogen | 7 | CO1 | K2 |
| (OR) | | | |
| c. Explain the concept of Hydrogen derived from fossil fuels | 8 | CO1 | K2 |
| d. How thermochemical cycles will form the process of Hydrogen, outline with a suitable process? | 7 | CO1 | K3 |
| 3.a. Explain the concept of fuel cells and their key components. | 8 | CO2 | K2 |
| b. Explain the physical and chemical phenomena involved in fuel cells. | 7 | CO2 | K2 |
| (OR) | | | |
| c. Describe the significance of stoichiometric coefficients and utilization percentages in fuel cells. | 8 | CO2 | K2 |
| d. Compare and contrast the voltage and current characteristics of fuel cells in parallel and series connections. | 7 | CO2 | K4 |
| 4.a. Provide a comprehensive overview of the operation scheme of Direct Methanol Fuel Cells (DMFCs) | 8 | CO3 | K2 |
| b. Explain in detail the process of mass flow rate calculation for fuel and oxygen in both single fuel cells and fuel cell stacks. | 7 | CO3 | K2 |
| (OR) | | | |
| c. Describe the energy conversion process involved in fuel cells for domestic power systems and compare it with traditional electricity generation methods in terms of emissions and environmental impact. | 8 | CO3 | K2 |
| d. Analyze the benefits of using fuel cells for domestic power systems, focusing on factors such as clean energy production, high efficiency, quiet operation, and grid independence | 7 | CO3 | K4 |
| 5.a. Discuss the applications of large-scale fuel cell power generation, including baseload power generation, distributed generation, backup power systems, and grid ancillary services. | 8 | CO4 | K2 |
| b. Evaluate the challenges facing large-scale fuel cell power generation, including cost implications and infrastructure requirements. | 7 | CO4 | K3 |
| (OR) | | | |
| c. Describe the operation of fuel cell vehicles (FCVs) and their key components, highlighting the advantages of zero-emission propulsion. | 8 | CO4 | K2 |
| d. Discuss the economic and environmental factors influencing the adoption of fuel cell vehicles, including initial costs and fuel costs. | 7 | CO4 | K2 |

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