QP Code: RA21BTECH808 | Reg. No | | | | | | | | | | | AR 21

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

B. Tech (Eighth Semester - Regular) Examinations, April – 2025

21BELPE48011/21BEEPE48011 – Hydrogen Energy and Fuel Cell

(EE & EEE)

Time: 3 hrs | Maximum: 70 Marks

Answer ALL questions

(The figures in the right-hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

		CO #	Blooms Level
Q.1.	Answer ***ALL*** questions		
a.	How does the concept of a "Hydrogen Economy" address energy and environmental concerns?	CO1	K1
b.	What are some challenges associated with the practical aspects of a hydrogen economy?	CO1	K2
c.	Explain the significance of green hydrogen in reducing carbon emissions and transitioning to a low-carbon future.	CO2	K2
d.	How are fuel cells different from traditional combustion engines in terms of noise pollution?	CO3	K4
e.	What is the main advantage of combining heat and power in fuel cell systems?	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

		Marks	CO #	Blooms Level
	Answer ***all*** the questions			
2. a.	What are the fundamental prerequisites for the transmission and infrastructure necessary for hydrogen fuel?	8	CO1	K1
b.	Could you outline the primary safety and environmental consequences associated with hydrogen fuel?	7	CO1	K2
	(OR)			
c.	Provide a concise overview of the economics involved in transitioning to hydrogen systems.	8	CO1	K2
d.	Explain the concept of Electrolysis of water.	7	CO1	K3
3.a.	What are the advantages and disadvantages of fuel cells?	8	CO2	K2
b.	What types of fuel cells exist, and what are their applications?	7	CO2	K1
	(OR)			
c.	Explain the operating conditions, and advantages and challenges associated with DMFC technology.	8	CO2	K3
d.	Examine the general issues of water flooding and water management in fuel cells, with a focus on proton exchange membrane fuel cells (PEMFCs)	7	CO2	K4
4.a.	Explain the modular design approach in large-scale power generation through fuel cells, highlighting its advantages in terms of scalability and flexibility to meet varying power demands.	8	CO3	K2
b.	Provide a comprehensive overview of the operation scheme of Direct Methanol Fuel Cells (DMFCs)	7	CO3	K3
	(OR)			

c.	Compare the environmental benefits of large-scale fuel cell power generation with conventional centralized power generation methods, emphasizing emissions reduction and resource efficiency.	8	CO3	K2
d.	Describe fuel cell vehicles (FCVs) operation and their key components, highlighting the advantages of zero-emission propulsion and fast refuelling times.	7	CO3	K4
5.a.	Describe the applications of large-scale fuel cell power generation in terms of baseload, distributed, and backup power systems.	8	CO4	K3
b.	Evaluate the challenges facing large-scale fuel cell power generation, including cost implications and infrastructure requirements in long-term durability of fuel cell systems.	7	CO4	K3
	(OR)			
c.	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.	8	CO4	K3
d.	Discuss the various types of fuel cells suitable for domestic power systems, highlighting the advantages of proton exchange membrane (PEM) fuel cells.	7	CO4	K2

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