Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Course: Energy and Energy Storage **Semester: IV**

Program: B.Tech APE **Time : 03 hrs.**

Course Code: EPEG2026 **Max. Marks: 100**

Instructions: Question contains 2 Pages.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Give the different categories of energy storage technologies with an example for each.	**4**	**CO1**
Q 2	Convert the following. (a) 50 boe to toe (b) 10 million Btu to Joules	**4**	**CO1**
Q 3	Demonstrate that fossil fuels are derivative of solar energy.	**4**	**CO1**
Q 4	Calculate the theoretical voltage of an alkaline electrolyser fed with water at 60°C and 1 atm. E^o = 1.23 V; ΔS = 163.25 J mol^{-1} K^{-1}; F = 96,485 C; T_o = 25°C.	**4**	**CO2**
Q 5	Illustrate the circular economy with an appropriate example.	**4**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q6	Classify the fuel cells and explain the working of any one of them in detail with the help of diagram. (Or) Classify the electrolysers and describe the functioning of any one of them in detail with the help of diagram.	**10**	**CO2**
Q 7	Name the ways of utilizing solar radiation and discuss any one of them in detail.	**10**	**CO2**
Q 8	Describe the methods to achieve net zero carbon emission while continuing to use fossil fuels.	**10**	**CO3**
Q 9	List the methods of mechanical energy storage system and explain any one of them in detail.	**10**	**CO2**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	(a) A lithium-ion battery of weight and volume of 10 kg and 4 L respectively contained 0.7 kg of Li^+ ions. Voltage of the battery is 3.8V and the atomic weight of lithium is 6.941 g mol^{-1}.	**6**	**CO2**

	Calculate the specific energy in Wh/g and energy density of the battery in Wh/L.		
	(b) Name the methods of thermal energy storage and explain any one of them in detail.	**8**	**CO2**
	(c) Give the applications of electrolysers and fuel cells in international space station.	**6**	**CO2**
	(Or)		
	(a) Calculate the amount of Lithium to be taken in lithium-ion battery in order to have the coulombic capacity of 5 Ah.	**6**	**CO2**
	(b) Explain the hybrid energy storage systems, their advantages and challenges.	**8**	**CO2**
	(c) Compare the fossil energy sources with alternate energy sources.	**6**	**CO2**
Q 11	(a) Write a detailed account of the three components of energy management systems.	**10**	**CO3**
	(b) Describe any two methods of waste heat recovery with the help of diagram and how do they help in energy management.	**10**	**CO3**