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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VIII**
Branch: Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 23CY8OEBMT **Max Marks: 100**
Course: Battery Materials and Technology

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Elucidate the construction and working of a supercapacitor.	CO1	PO1	**6**
	b)	Define the following battery characteristics: (i) Cycle life (ii) Energy density (iii) Shelf life (iv) Capacity	CO1	PO1	**8**
	c)	What is carbon cycle? Explain its significance.	CO1	PO1	**6**
		OR			
2	a)	Give the classification of batteries with examples.	CO1	PO1	**6**
	b)	What are supercapacitors? Elaborate on the basic components of a supercapacitor.	CO1	PO1	**8**
	c)	Analyze the advantages of electrochemical energy storage over conventional energy storage.	CO1	PO1	**6**
		UNIT - II			
3	a)	Analyze the role of electrolyte and separator in efficient working of a battery.	CO2	PO2	**6**
	b)	Elaborate on the different types of cathode materials used in batteries.	CO2	PO2	**8**
	c)	Explain any two battery testing methods.	CO2	PO2	**6**
		OR			
4	a)	Discuss the role of following in energy storage systems: i) Current collectors and ii) Binders.	CO2	PO2	**6**
	b)	Explain the various physical and electrochemical characterization of materials employed in batteries.	CO2	PO2	**8**
	c)	Elaborate on the different anode materials used in super capacitors. Mention their characteristics.	CO2	PO2	**6**
		UNIT - III			
5	a)	Describe the construction and working of zinc-air battery. List their advantages.	CO3	PO7	**6**
	b)	Explain the construction and charging-discharging reactions of a lead-acid battery. Highlight the disadvantages of lead acid	CO1	PO1	**8**

			battery.			
		c)	What are reserve batteries? Explain with an example.	*CO3*	*PO7*	**6**
			OR			
	6	a)	Write the charging reactions of a Ni-Cd battery. Mention its salient features.	*CO1*	*PO1*	**6**
		b)	Discuss the advantages and disadvantages of Ni-MH batteries. Write the reactions involved during their working in discharge mode.	*CO3*	*PO7*	**8**
		c)	Outline the construction and working of a Zn-Ag_2O battery. Mention its applications.	*CO3*	*PO7*	**6**
			UNIT - IV			
	7	a)	Explain the working of redox flow batteries with a suitable example.	*CO3*	*PO7*	**6**
		b)	Discuss the construction and working of Li-ion batteries. Explain why Li is an attractive material for the development of modern batteries.	*CO3*	*PO7*	**8**
		c)	Analyze the challenges posed by Li and Na ion batteries.	*CO4*	*PO12*	**6**
			OR			
	8	a)	Discuss the construction and working of Li-Sulphur battery. Mention its advantages over Li-ion battery.	*CO3*	*PO7*	**6**
		b)	Explain the construction and working of Na-ion battery. Mention the advantages of using sodium in batteries.	*CO3*	*PO7*	**8**
		c)	Discuss the role of batteries in the following areas: i) electric vehicles and ii) storage in electricity supply networks.	*CO4*	*PO12*	**6**
			UNIT - V			
	9	a)	Explain the hydrometallurgical extraction of copper from battery waste.	*CO4*	*PO12*	**6**
		b)	Elaborate on the necessity of battery recycling.	*CO4*	*PO12*	**8**
		c)	Discuss the key industrial activities involved in battery recycling.	*CO4*	*PO12*	**6**
			OR			
	10	a)	Elucidate the pyrometallurgical extraction of lithium from battery waste.	*CO4*	*PO12*	**6**
		b)	Summarize the ecological aspects of battery recycling.	*CO4*	*PO12*	**8**
		c)	Elaborate on the challenges connected to sustainability in battery recycling.	*CO4*	*PO12*	**6**

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