Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3170923 Date:01-12-2023

Subject Name: Electrical and Hybrid Vehicle

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Enlist the various types of electric drive train topologies used in the present.	**03**
	(b)	Give the comparison of IC engine vehicle, Hybrid EV and Battery EV.	**04**
	(c)	Discuss the challenges in development of electric vehicle and how to overcome it.	**07**
Q.2	**(a)**	Write the advantages of adopting electrical vehicles in public & goods transport in India.	**03**
	(b)	Draw the architecture of series hybrid and parallel hybrid EV.	**04**
	(c)	Draw schematic diagram and explain Fuel cell based electrical vehicle and also discuss its limitations.	**07**
		OR	
	(c)	Derive the expressions for various forces acting on the vehicle while moving on a flat surface.	**07**
Q.3	**(a)**	Define rolling resistance for electric vehicle.	**03**
	(b)	Discuss the aerodynamic force and aerodynamic drag in SUV car & Sedan car and conclude which one has perfect aerodynamic design.	**04**
	(c)	Draw and explain series-parallel hybrid electrical vehicle in detail. Also indicate power flow directions while vehicle moving towards down-hill.	**07**
		OR	
Q.3	**(a)**	Write the advantage of Switch Reluctance Motor.	**03**
	(b)	Explain V/f speed control method for induction motor based EV.	**04**
	(c)	Draw and explain configuration of DC motor drive and its control strategy.	**07**
Q.4	**(a)**	Enlist the limitation of Lead-Acid battery related to its application in EV.	**03**
	(b)	Differentiate Super capacitor and Battery.	**04**
	(c)	Draw and explain Fly wheel based energy storage system with its limitation.	**07**
		OR	
Q.4	**(a)**	Define C rate of battery for charging and discharging.	**03**
	(b)	Define the following term related to battery (1) Specific Power (2) Specific Energy	**04**
	(c)	Enlist various Fuel cell based energy generation technologies and discuss any one Fuel cell based energy generation in detail with schematic diagrams.	**07**
Q.5	**(a)**	Explain the braking of EV with & without Antilock Brake System (ABS).	**03**
	(b)	Explain Solar powered electric vehicle with its limitation.	**04**
	(c)	Write the different types of energy storage technologies suitable for hybrid electrical vehicle. Explain the Lithium-ion battery in detail.	**07**
		OR	

Q.5	**(a)**	Give the classification of different energy management strategies in EVs.	**03**
	(b)	Draw and explain battery charging system for EVs.	**04**
	(c)	Explain electronically controlled regenerative braking system for Hybrid electric vehicle and Battery electric vehicle with schematic diagram.	**07**

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