Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2025

Subject Code:3170923 Date:08-05-2025

Subject Name:Electrical and Hybrid Vehicle

Time:02:30 PM TO 05:00 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)**	Give Comparisons of Hybrid Electric Vehicles and Conventional Vehicles?	**03**
	(b)	Explain different types of forces acting on vehicle due to air friction.	**04**
	(c)	Prepare a block diagram of Battery Electric Vehicle (BEV) with all necessary components and explain it in brief.	**07**
Q.2	**(a)**	List economic and environmental impact of electric hybrid vehicle.	**03**
	(b)	Give the operation and controlling of DC motor drive.	**04**
	(c)	Compare series hybrid and parallel hybrid system with their merits and demerits.	**07**
		OR	
	(c)	Explain historical development of automobile and development of interest and activity in the EV from 1890 to present day.	**07**
Q.3	**(a)**	What type of operation is known as flux weakening in permanent magnet machines?	**03**
	(b)	Draw torque-speed characteristics of following motors and suggest best for EV with reason. (1) Induction Motor (IM) (2) Permanent Magnet Synchronous Motor (PMSM) (3) Switched Reluctance Motor (SRM) (4) Permanent Magnet Brushless DC Motor (PMBLDC)	**04**
	(c)	Explain the difference between ultracapacitor and battery as an energy Storage device for EV.	**07**
		OR	
Q.3	**(a)**	Explain following terms (1) Vehicle to Grid (V to G) (2) Vehicle to Load (V to L) (3) Vehicle to Vehicle (V to V)	**03**
	(b)	List the optimization-based strategies in Hybrid Electrical Vehicles.	**04**
	(c)	Explain Electronically controlled regenerative braking system functioning as an ABS.	**07**
Q.4	**(a)**	What are the main issues with fuel cells in electric vehicle application?	**03**
	(b)	Prepare schematic diagram of solar and grid connected charging station.	**04**
	(c)	Prepare and explain a complete driving control method for Induction Motor in electrical vehicle application.	**07**

OR

Q.4	**(a)**	Define the term hybridness?	**03**
	(b)	What is a plug-in HEV? Explain with figure.	**04**
	(c)	Define following terms (1) Specific energy (2) Specific power (3) Energy density (4) Ambient temperature (5) Life cycle of battery (6) Energy stored (7) Charge capacity	**07**
Q.5	**(a)**	Give the Differences Between BEV, HEV and FCEV.	**03**
	(b)	Draw and explain driver circuit for 3 phase SRM	**04**
	(c)	Draw and Explain typical CAN network for HEVs.	**07**

OR

Q.5	**(a)**	Explain the Energy Management concept for HEV.	**03**
	(b)	Draw and explain driver circuit for 3 phase BLDC motor.	**04**
	(c)	Give the Comparison of Lithium Ion and Lead Acid Battery Configurations in EV.	**07**

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