

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2022****Subject Code:3170923****Date:14/06/2022****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 a detailed classification of Electrified Vehicles.	03
	(b) Is Electric Vehicle (EV) a future of transportation? Justify your answer.	04
	(c) Prepare a block diagram of Battery Electric Vehicle (BEV) with all necessary components and explain it in brief.	07
Q.2	(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) Derive the vehicle dynamic equation and explain all acting forces on vehicle with appropriate figure.	04
	(c) Draw and explain Hybrid Electric Vehicle (HEV) with appropriate block diagram. (Note: BEV + IC vehicle)	07
OR		
	(c) Draw and explain Hybrid Electric Vehicle (HEV) with appropriate block diagram. (Note: BEV + Fuel Cell vehicle)	07
Q.3	(a) How many batteries (12 V, 20 Ah) are required to fulfill the requirements of 108V, 60 Ah for EV. Provide connection diagram	03
	(b) What is a plug-in HEV? Explain with figure.	04
	(c) Draw and explain a series-parallel HEV with appropriate diagram.	07
OR		
Q.3	(a) How fuel cell works?	03
	(b) Compare BEV, FCEV with IC engine vehicle for efficiency and performance.	04
	(c) What is a difference between series HEV and Parallel HEV? Compare with figure.	07
Q.4	(a) How electric traction (locomotive) works? Explain with figure.	03

- (b) Prepare and explain a complete driving control method for Induction Motor in electrical vehicle application. **04**
- (c) Define following terms **07**
- (1) Specific energy
 - (2) Specific power
 - (3) Energy density
 - (4) Ambient temperature
 - (5) Life cycle of battery
 - (6) Energy stored
 - (7) Charge capacity

OR

- Q.4** (a) Which types of qualities are required in electric motors for EV application? **03**
- (b) Draw torque-speed characteristics of following motors and suggest best for EV with reason. **04**
- (1) Induction Motor (IM)
 - (2) Permanent Magnet Synchronous Motor (PMSM)
 - (3) Switched Reluctance Motor (SRM)
 - (4) Permanent Magnet Brushless DC Motor (PMBLDC)
- (c) Compare Lead-acid battery, nickel-cadmium battery and lithium-iron batteries for following terms (put specific values only) **07**
- (1) Nominal voltage level
 - (2) Specific energy
 - (3) Energy density
 - (4) Number of life cycle
 - (5) Material of Anode, cathode and electrolyte
 - (6) Recharge time

- Q.5** (a) How flywheel works as an energy storage device? **03**
- (b) Give a classification of different energy management strategies. **04**
- (c) What is a driving cycle? Draw and explain different driving cycles. How it helps in modelling of EV? **07**

OR

- Q.5** (a) What is a difference between batteries and super capacitor? (Explain with charging and discharging characteristic) **03**
- (b) Prepare schematic diagram of solar and grid connected charging station. **04**
- (c) Draw and explain driver circuit for 3 phase SRM. **07**
