Q. Code: 821227

Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Seventh Semester

EE18703 – ELECTRIC VEHICLES

(Electrical and Electronics Engineering)

(Regulation 2018 / 2018 A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Acquire knowledge on the architecture of Electric Vehicles.	**2**
CO 2	Analyze different propulsion technology used for electric vehicle application.	**4**
CO 3	Analyze different energy storage technology used for electric vehicle application.	**4**
CO 4	Design the subsystems of an electric vehicle.	**4**
CO 5	Acquire knowledge on energy management strategies and charging technologies in EVs.	**2**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Assess the flexibility of Electric Vehicles (EVs) in comparison to Internal Combustion Engine Vehicles (ICEVs).	**1**	**4**
2.	Enumerate the force parameters of vehicle dynamics that necessitate consideration of EV design.	**1**	**2**
3.	List the factors that limits the use of DC motors in electric vehicle (EV) drive train.	**2**	**2**
4.	Examine the reason for SRM motor drive used as most promising candidate in EV and HEV applications.	**2**	**4**
5.	Define C-rate of battery.	**3**	**2**
6.	Compare symmetrical and asymmetrical ultracapacitors based on construction.	**3**	**4**
7.	Examine the optimal operational region of the motor characteristics given in Figure 1 for Electric Vehicle (EV) use and justify the selection.	**4**	**4**

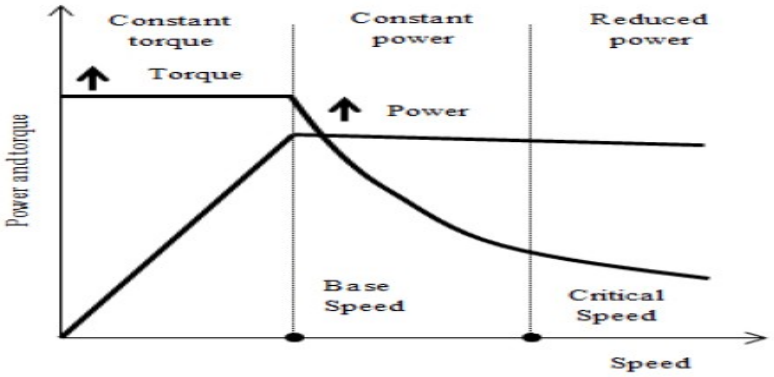

Figure 1

8.	What are all the factors to be influence the selection of an energy storage system in EVs?	**4**		**3**
9.	Identify two potential challenges associated with implementation of V2G.	**5**		**3**
10.	Differentiate Normal and Fast charging based on power level and performance.	**5**		**4**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Depict the top-level perspective schematic of an Electric Vehicle (EV) system and provide a detailed explanation of its components. Examine the interrelationships and functions of each element, highlighting how the integration of various components contributes to the overall efficiency and performance of the EV system.	**(14)**	**1**	**4**
	(OR)			
(b)	Analyze the modes of power flow control of hybrid electric drive trains where engine supplies its power mechanically to the wheels and it is assisted by an electric motor that is mechanically coupled to the transmission.	**(14)**	**1**	**4**
12. (a)	Derive the mathematical model for the allowed switching states of suitable two-quadrant chopper for DC drive in EV. Perform the steady state analysis and derive the relation for ripple.	**(14)**	**2**	**3**
	(OR)			
(b)	Apply the vector controlled speed control method for induction motor and discuss its impact in EV application.	**(14)**	**2**	**3**

13. (a)	Analyze the selection criteria for the two primary types of fuel cells often deemed appropriate for energy storage in vehicle applications. Justify the rationale behind choosing these fuel cell types and elucidate their operational principles.	**(14)**	**3**	**4**
	(OR)			
(b)	Examine the hybridization of energy sources for different drive pattern and summarize the advantages.	**(14)**	**3**	**4**
14. (a)	With the understanding of planetary gear sets to the sizing of drive trains, explain in detail their function and different configurations based on input-output relationships.	**(14)**	**4**	**2**
	(OR)			
(b)	Identify and describe the various subsystems linked to control units in Electric Vehicles (EVs), highlighting their operational roles within the EV.	**(14)**	**4**	**2**
15. (a)	What factors and criteria were taken into account when deciding on the use of specific charging algorithms for electric vehicles, and how do these below listed algorithms contribute to the overall effectiveness of the charging process? • Constant Current Constant Voltage (CCCV) charging • Trickle charging • Pulsed charging • Float charging	**(14)**	**5**	**3**
	(OR)			
(b)	Elaborate the intricate functions and mechanisms employed by BMS in managing input parameters and regulating output to optimize the operation of EVs.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	"The Indian government is aiming for EV adoption to reach 40 percent for buses, 30 percent for private cars, 70 percent for commercial vehicles, and 80 percent for two-wheelers by the year 2030". Evaluate the driving forces propelling this transition and critically analyze potential solutions for the	**(10)**	**1**	**4**

challenges faced by EVs to ensure their widespread adoption and successful integration into the automotive market.

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