U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 21ME5DEEV1 **Max Marks: 100**
Course: Electric and Hybrid Vehicles - 1 **Date: 14.09.2023**

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

UNIT - I

1	a)	With the help of a block diagrams explain the EV Configuration based on variations in Electric Propulsion system.	**08**
	b)	Define degree of hybridization? With a neat sketch explain the series hybrid electric vehicle.	**07**
	c)	Write a note on i) Battery charging technologies ii) Range extender batteries	**05**

OR

2	a)	With a neat sketch explain Solar powered Electric Vehicles. and mention two advantages of it.	**07**
	b)	What are the initiatives made by the government of India to promote Electric vehicles in India? Explain any two initiatives in detail	**08**
	c)	How EV drive trains are different from the ICE drive train? Explain in detail	**05**

UNIT - II

3	a)	What is road load? With necessary diagram explain the importance of Aerodynamic drag force (F_d), rolling resistance force (F_r) and climbing force (F_c) in electric vehicle.	**10**
	b)	A vehicle needs to reach maximum speed v_f in T seconds. Derive expressions for average power and peak power i) if it accelerates linearly. ii) if it accelerates at a rate "a_1" for first T/2 time and at a rate "$a_1/2$" from T/2 to T. Hence prove that peak power reduces to 2/3 rd of the peak power required for linear acceleration.	**10**

UNIT - III

4	a)	Define battery? Explain in detail, the main parameters which are affects the behaviour and performance of a battery?	**10**
	b)	With a neat sketch explain the working of lithium-ion battery and write chemical reactions occurs during charging and discharging.	**10**

OR

5	a)	Write a note on the followings i) State of charge (SOC), ii) State of health (SOH), iii) State of Life (SOL), iv) Battery Modelling	**10**
	b)	Explain the construction details of cylindrical, pouch and prismatic cells with neat sketch.	**10**

UNIT - IV

6	a)	With a suitable circuit explain the active balancing and passive balancing used in the BMS and which one you recommend?	**08**
	b)	With the help of block diagram explain the function of each element involved in battery management system.	**07**
	c)	Explain the followings i) Battery pack ii) Battery cost	**05**

UNIT - V

7	a)	With a neat sketch explain the different methods of charging in EVs.	**08**
	b)	What is EV Charging? What is the role of on-board charger and off-board charger explain with necessary diagram?	**07**
	c)	Write note on the following i) Charging standards ii) charger protocol	**05**

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