

Reg.No.:

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80035

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – FEB. 2025

First Semester

Power Systems Engineering

P23PSE05 – ELECTRIC AND HYBRID VEHICLES

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What is tractive effort?	2	K2	CO1
2.	Define rolling resistance.	2	K1	CO1
3.	What are the operating modes of series hybrid electric drive train?	2	K1	CO2
4.	Write the torque velocity equations of electric vehicle.	2	K1	CO2
5.	Classify the topologies of power converter.	2	K3	CO3
6.	List the advantages of vector control of induction motor drives.	2	K1	CO3
7.	Define gradeability.	2	K2	CO4
8.	Justify the need of transmission system in EV.	2	K4	CO4
9.	What are the requirements of the EV charging system?	2	K2	CO5
10.	Draw the characteristics of constant current and constant voltage charging methods.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Describe the mathematical models to evaluate vehicle performance.	13	K2	CO1
	(OR)			
b)	Explain the basics of vehicle performance.	13	K2	CO1
12. a)	With the help of a neat block diagram, explain different subsystems of electric drive train.	13	K2	CO2
	(OR)			
b)	Explain the different power flow control modes of a typical parallel hybrid system with the help of block diagrams.	13	K2	CO2
13. a)	Draw and briefly explain different configurations of drivetrains in electric vehicles.	13	K2	CO3
	(OR)			
b)	Explain the two-quadrant operation of chopper DC motor drive with suitable waveforms for electric vehicle.	13	K3	CO3
14. a)	Explain fuel cell and flywheel as energy source elements in electric and hybrid electric vehicle.	6+7	K3	CO4
	(OR)			
b)	Comparatively evaluate the different charging modes of batteries.	13	K4	CO4
15. a)	Elaborate energy management system and issues of energy management strategies of EHV	13	K2	CO5
	(OR)			
b)	Explain any one charging technique with schematic of charging station.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	What elements influence the performance of battery management systems in electric vehicles, and how do engineers fine-tune these elements to improve energy efficiency and longevity?	15	K4	CO5
	(OR)			
b)	Explain peak torque, continuous rating, intermittent overload operation, and peak overload operation of electric motors used in electric vehicles. Also, mark these parameters in the torque speed characteristics.	15	K4	CO3