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Code No. : 17354 N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.E.E.) VII-Semester Main & Backlog Examinations, Dec.-23/Jan.-24**Electric and Hybrid Vehicles (PE-III)**

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B****Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	What are the ranges of well to wheel efficiencies of battery electric vehicles and internal combustion engine vehicles?	2	1	1	1,2,3,4
2.	List out all the forces acting on a moving vehicle.	2	1	1	1,2,3,4
3.	Outline the importance of regenerative braking.	2	2	2	1,2,3,4
4.	Compare full hybrid and plug-in hybrid electric vehicles.	2	4	2	1,2,3,4
5.	Differentiate the features of an electric vehicle motor from an industrial motor.	2	4	3	1,2,3,4
6.	Differentiate surface inset and interior-radial permanent magnet motors.	2	4	3	1,2,3,4
7.	Define specific power and depth of discharge (DoD) of a battery.	2	1	4	1,2,3,4
8.	What are the inputs and outputs of a fuel cell?	2	1	4	1,2,3,4
9.	Compare vehicle to grid (V2G) and grid to vehicle (G2V) operations of an electric vehicle.	2	4	5	1,2,3,4
10.	Discuss the demerits of wireless charging.	2	2	5	1,2,3,4
Part-B (5 × 8 = 40 Marks)					
11. a)	Analyze the rolling resistance encountered by a moving vehicle, providing a detailed explanation and accompanying sketch to depict this phenomenon?	4	4	1	1,2,3,4
b)	Given an electric vehicle with an electric motor rated at 254 Nm torque and 80 kW power, along with a gear ratio of 8.19 and a wheel radius of 0.315 m, what are the respective rated speeds of the electric motor and the vehicle?	4	4	1	1,2,3,4
12. a)	Draw and examine the power flow in internal combustion engine dominated series-parallel type of hybrid electric vehicle.	4	4	2	1,2,3,4
b)	Draw the block diagram of an In-wheel motor drive and explain the function of each block.	4	4	2	1,2,3,4
13. a)	Explain the configuration of permanent magnet synchronous motor drive for electric vehicle application with a neat diagram.	4	2	3	1,2,3,4
b)	Classify the various types of electric motors used in electric vehicle (EV) applications and analyze their advantages and disadvantages concerning their use in EVs.	4	2	3	1,2,3,4

14. a)	Explain the energy storage requirements of hybrid electric vehicles.	4	2	4	1,2,3,4
b)	Illustrate the flywheel based energy storage system for hybrid electric vehicles with a neat diagram.	4	2	4	1,2,3,4
15. a)	Discuss the battery swapping in an electric vehicle with a neat diagram.	4	2	5	1,2,3,4
b)	Draw the block diagram of energy management system (EMS) for EVs and explain the function of each block.	4	3	5	1,2,3,4
16. a)	Derive an expression of the tractive effort of a moving vehicle.	4	2	1	1,2,3,4
b)	Record the obstacles or challenges hindering the widespread adoption of electric vehicles (EVs).	4	1	2	1,2,3,4
17.	Answer any <i>two</i> of the following:				
a)	Describe the configuration of DC motor drive for electric vehicle application with a neat diagram.	4	1	3	1,2,3,4
b)	Discuss about the battery-based energy storage for an electric vehicle.	4	2	4	1,2,3,4
c)	Compare the three primary levels of electric vehicle charging topologies, highlighting their distinct features and capabilities.	4	4	5	1,2,3,4

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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