



IV B.Tech I Sem Regular End Examination, Nov/Dec 2022

Electrical and Hybrid Vehicles

(EEE)

Time: 3 Hours.**Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part – A, answer all questions which carries 20 marks.

3. In Part – B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

PART- A**(10*2 Marks = 20 Marks)**

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|-------|--|----|-----|-----|
| 1. a) | Draw the architecture of parallel EHV. | 2M | CO1 | BL1 |
| b) | What are the different types of energy carriers especially in transport mechanism? | 2M | CO1 | BL1 |
| c) | What are the challenges and key technologies of EHV? | 2M | CO2 | BL1 |
| d) | How EHV impact on Economic Growth | 2M | CO2 | BL1 |
| e) | What are the challenges and key technologies of EHV? | 2M | CO3 | BL1 |
| f) | Draw the load and engine characteristics of EHV. | 2M | CO3 | BL1 |
| g) | What are the advantages of bidirectional battery charging. | 2M | CO4 | BL1 |
| h) | How to characterize the Batteries. | 2M | CO4 | BL1 |
| i) | How to measure state of charge of batteries | 2M | CO5 | BL1 |
| j) | Draw the structure of ultracapacitor as a battery. | 2M | CO5 | BL1 |

PART- B**(10*5 Marks = 50 Marks)**

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|-----------|--|----|-----|-----|
| 2. a) | How to convert conventional vehicle to EHV. | 5M | CO1 | BL1 |
| b) | Explain the various mathematical models that are considered for assigning the vehicle performance. | 5M | CO1 | BL4 |
| OR | | | | |
| 3. a) | Explain the terms rolling resistance and aerodynamics drag in vehicles and derive the expression for vehicle translation speed from fundamentals | 5M | CO1 | BL4 |
| b) | What are the limitations of electric vehicles? Explain the impact on power demand. | 5M | CO1 | BL4 |
| 4. a) | What is the significance of a communication network in electric/hybrid vehicles? What are the functions of the in-vehicle communication network? | 5M | CO2 | BL1 |
| b) | Elaborate with neat sketch the configuration and control of Induction Motor Drives | 5M | CO2 | BL5 |

OR

- 5 a) Draw the typical torque Vs speed envelope curves of drivetrain motors and show the continuous, intermittent and peak overload ratings. 5M C02 BL1
- b) Explain the control strategy implemented in Switched Reluctance Motor Drives. 5M C02 BL4
- 6 a) What are the fundamentals of vehicle system modelling? 5M C03 BL1
- b) Explain the four-quadrant chopper control of DC motor. What is the advantage of AC motors over DC motors for EV applications? 5M C03 BL4
- OR**
- 7 a) Explain the impact of Drive System Efficiency in modern Hybrid Electric Vehicles 5M C03 BL4
- b) Explain the power flow control modes for a series-parallel hybrid vehicle 5M C03 BL4
- 8 a) Explain the working principle of Nickel-Metal Hydride battery with neat figures and relevant chemical reactions. Compare its major performance parameters with Lead-Acid batteries 5M C04 BL4
- b) Describe the terms State of Charge and Depth of Discharge as applied to Batteries 5M C04 BL2
- OR**
- 9 a) To electrify the vehicles or not, if what are the ultimate issues? 5M C04 BL1
- b) In Induction Motors, explain how the torque speed characteristics is modified over its entire speed range (Including field-weakening mode) 5M C04 BL4
- 10 a) Draw the architecture of grid to vehicle to charging system. 5M C05 BL1
- b) Explain Battery safety concerns and methods. 5M C05 BL4
- OR**
- 11 a) Draw the schematic diagram of the over all power management control implementation interface for a vehicular system. 5M C05 BL1
- b) Write the design steps involved in modeling hybrid electric vehicle. 5M C05 BL1

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CO - Course Outcome

BL - Blooms Taxonomy Levels