

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**  
**IV B. Tech I Semester Advanced Supplementary Examinations – March 2025**

## HYBRID ELECTRIC VEHICLES

(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from Each unit

All Questions Carry Equal Marks

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## UNIT-I

1.
  - a) Explain the important constituents of a Conventional vehicle. [7M]
  - b) What do you mean by propulsion load and what are the factors on which it depend and also explain the non- propulsion loads? [7M]

(OR)

2.
  - a) Distinguish in detail between an EV and HEV? [7M]
  - b) What are the main constituents of an HEV and explain the significance of each one them in brief? [7M]

## UNIT-II

3.
  - a) List and explain the limitations of EVs. [7M]
  - b) Explain the architecture of Series – parallel HEVs. [7M]

(OR)

4.
  - a) Explain the configuration of a Parallel HEV with a neat diagram. [7M]
  - b) Draw and explain the possible architecture for the plug in hybrid vehicle. [7M]

### UNIT-III

5.
  - a) Explain the basic configuration of an Permanent magnet synchronous motor [7M]
  - b) Distinguish between Saturated motor and unsaturated motors Permanent motor configurations? [7M]

(OR)

6.
  - a) List and explain the characteristics that need to be taken care for use of traction drive. [7M]
  - b) Explain the control strategy of Switch reluctance motor used in Hybrid Electric vehicles. [7M]

## UNIT-IV

7. a) Draw and explain the schematic of a Power converter used in Electric vehicles [7M]  
b) Explain the full bridge DC – DC converter with a neat circuit topology. [7M]

(OR)

8. a) Describe the operating principle of Buck converter used in Hybrid Electric vehicles with a neat diagram? [10M]  
b) Explain in brief about non – isolated Bidirectional DC – DC Converter. [4M]

## UNIT-V

9. Explain the following terms w.r.t Battery characterization: [14M]
- i) State of charge
  - ii) Specific Energy and Energy Density
  - iii) Specific Power and power density
  - iv) Energy Efficiency
  - v) Number of Deep Cycles

(OR)

10. Compare the different Energy storage technologies suitable for hybrid Electric vehicles? [14M]

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