



## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

**Eighth Semester, B.E. - Automobile Engineering**

**Semester End Examination; June - 2017**

**Hybrid Vehicles**

*Time: 3 hrs*

*Max. Marks: 100*

*Note: Answer FIVE full questions, selecting ONE full question from each unit.*

### UNIT - I

- |      |  |    |
|------|--|----|
| 1 a. | List and explain the basic vehicle dynamic attributes for hybrid propulsion simulation with neat sketch.   | 8  |
|      | b. How do you compute vehicle fuel economy? Explain.   | 6  |
|      | c. Define grid connected hybrids. List their advantages and disadvantages.   | 6  |
| 2 a. | What is a hybrid vehicle? Explain the configurations of series hybrid electric vehicle and parallel electric vehicle drive train architecture with a neat block diagram. | 10 |
|      | b. What are the operating modes and control strategy of parallel mild hybrid electric drive train? Explain with sketch.  | 10 |

### UNIT - II

- |      |  |    |
|------|--|----|
| 3 a. | Explain the principle of operation and performance of DC motor drives with sketches. Mention their applications.     | 10 |
|      | b. Sketch and explain AC induction type motor. List advantages and disadvantages also mention their applications.    | 10 |
| 4 a. | How is torque and speed controlled in brushes DC motor? Explain with block diagram. Mention its merits and demerits. | 10 |
|      | b. Explain the working of AC synchronous motor with neat sketch.   | 10 |

### UNIT - III

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|------|--|----|
| 5 a. | How do you assess the vehicle performance on grades and during cruise of hybrid vehicles? Explain with an example. | 8  |
|      | b. Write a short note on Usage requirements of hybrid power plant.   | 6  |
|      | c. Explain braking and energy recuperation in hybrid vehicles.   | 6  |
| 6 a. | What is meant by matching of electric drive and ICE? Explain and mention its importance.                           | 10 |
|      | b. Explain with a neat sketch, Simpson type stepped automatic transmission.  | 10 |

### UNIT - IV

- |      |  |    |
|------|--|----|
| 7 a. | Define the following :                     |    |
|      | i) Battery capacity                        | 12 |
|      | ii) Specific energy of battery             |    |
|      | iii) Depth of discharge                    |    |
|      | iv) Ragone plot of energy storage systems. |    |

- b. With neat diagram, explain NiMH battery fits into the operation of hybrid vehicle. 8
- 8 a. Enumerate types of batteries. Explain with neat sketch, the construction and working principle of a lead-acid battery. 12
- b. Explain Lithium-Ion battery used in hybrid vehicles with sketches. 8
- UNIT - V**
- 9 a. List the various types of fuel cell. Explain the fuel cell characteristics and also mention the fuel and electrolyte used in fuel cell. 10
- b. With neat sketch, explain construction and working of proton exchange membrane fuel cell (PEM). Mention its merits. 10
- 10 a. Explain the following :  
i) Hydrogen storage system 10  
ii) Hydrogen reform.
- b. With block diagram, explain fuel cell based electric vehicle. 5
- c. Explain the flywheel which is used in hybrid vehicles. 5

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