

B. TECH.
(SEM VI) THEORY EXAMINATION 2022-23
ELECTRIC AND HYBRID VEHICLES

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

- a. Enumerate the social and environmental advantages of electric and hybrid vehicles.
- b. Describe the brief history of hybrid and electric vehicles.
- c. Name and describe the electric components used in hybrid and electric vehicles
- d. Explain the drive system efficiency in hybrid and electric vehicles.
- e. Explain the energy storage requirements in hybrid and electric vehicles
- f. Discuss various advantages and challenges of battery-based energy storage systems.
- g. Briefly explain the process of sizing the power electronics devices while designing hybrid and electric vehicles.
- h. Discuss the role of communications in hybrid and electric vehicles.
- i. Discuss the implementation issues associated with energy management strategies.
- j. List the key factors that influence energy management in hybrid and electric vehicles.

SECTION B

2. Attempt any three of the following: 10x3=30

- a. What are the basics of vehicle performance, and how is vehicle power source characterized? Discuss the transmission characteristics and the mathematical models used to describe performance of conventional vehicles.
- b. Describe the configuration and control of permanent magnet motor drives in hybrid and electric vehicles
- c. Compare various types of battery-based energy storages used in hybrid and electric vehicles.
- d. Explain the process of selecting the energy storage technology in hybrid and electric vehicles comprehensively.
- e. Compare and contrast different energy management strategies used in hybrid and electric vehicles

SECTION C

- 3. Attempt any *one* part of the following: 10x1=10**
- a. Discuss the basic concept of electric traction, and introduce various electric drive-train topologies. Explain power flow control in electric drive-train topologies, and analyze fuel efficiency.
 - b. Explain the concept of hybrid traction, and introduce various hybrid drive-train topologies. Discuss power flow control in hybrid drive-train topologies, and analyze fuel efficiency.
- 4. Attempt any *one* part of the following: 10x1=10**
- a. Explain the configuration and control of DC motor drives in hybrid and electric vehicles
 - b. Discuss the configuration and control of induction motor drives in hybrid and electric vehicles.
- 5. Attempt any *one* part of the following: 10x1=10**
- a. Discuss flywheel-based energy storage in hybrid and electric vehicles, including the principle of operation and the advantages and disadvantages of this type of energy storage.
 - b. Explain the hybridization of different energy storage devices in hybrid and electric vehicles. Discuss the challenges associated with hybridization.
- 6. Attempt any *one* part of the following: 10x1=10**
- a. Explain the process of matching the electric machine and the internal combustion engine (ICE) in hybrid electric vehicles, including the considerations for torque, power, efficiency etc.
 - b. Describe the procedure of sizing the propulsion motor in hybrid and electric vehicles on account of the attributes such as torque, power, and speed.
- 7. Attempt any *one* part of the following: 10x1=10**
- a. Describe the concept of energy management in hybrid and electric vehicles, and explain why it is important for achieving optimal performance and efficiency.
 - b. Classify different energy management strategies used in hybrid and electric vehicles.