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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: II - THEORY EXAMINATION (2025 - 2026)

Subject: Hybrid Vehicle Technology

Time: 3 Hours

Max. Marks: 70

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

15

1. Attempt all parts:-

- (1.1) Which of the following is NOT a kind of DCFC plug (CO1,K1) 1
- (a) J1772
 - (b) CHAdeMO
 - (c) SSA/CCS
 - (d) Supercharger
- (1.2) Which of the following method of speed control of DC machine will offer minimum efficiency? (CO2,K1) 1
- (a) Armature control method
 - (b) Field control method
 - (c) Voltage control method
 - (d) All above methods
- (1.3) Which of the following is the advantage of alkaline battery? (CO3,K1) 1
- (a) High energy density
 - (b) Good discharge characteristics over a wide range of temperature
 - (c) The specific gravity of electrolyte remains the same
 - (d) Cheap raw materials are used
- (1.4) Which of vehicle bus system below have a fastest transfer speed? (CO4,K1) 1
- (a) MOST
 - (b) Drive Train CAN
 - (c) LIN - Bus
 - (d) Flex - ray

- (1.5) If power factor is less than unity then it will result in (CO5,K1) 1
- (a) Large kVA rating of equipment
 - (b) Greater conductor size
 - (c) Large copper losses
 - (d) All of these

2. Attempt all parts:-

- (2.1) What is an EGR? (CO1,K1) 2
- (2.2) What are the advantages of microprocessor based control of traction motors? (CO2,K1) 2
- (2.3) Define the Fuel Cell efficiency and show the characteristics curves. (CO3 , K1) 2
- (2.4) What are the two fundamental sizing constraints on an electric machine? (CO4,K1) 2
- (2.5) Define power factor. (CO5,K1) 2

SECTION-B 20

Answer any one of the following:-

- (3.1) Explain rolling resistance and aerodynamic drag in vehicles. (CO1,K2) 4
- (3.2) Explain historical background of EV and HEV technology involvement. (CO1,K2) 4

Answer any one of the following:-

- (3.3) What is the function of yoke? Explain the choice of materials for the yoke? (CO2,K2) 4
- (3.4) Describe the configuration of a permanent magnet motor drive system in electric vehicles.(CO2 , K2) 4

Answer any one of the following:-

- (3.5) Write the short note on History of Fuel Cell Vehicles. (CO3,K2) 4
- (3.6) Small flywheel is used in multi-cylinder engine. Why? (CO3,K2) 4

Answer any one of the following:-

- (3.7) Explain CAN and LIN. (CO4,K2) 4
- (3.8) Explain and draw Torque vs Speed curve of an electric machine. (CO4 , K2) 4

Answer any one of the following:-

- (3.9) Explain the meaning of Fuel and Energy substitution with examples. (CO5,K2) 4
- (3.10) Discuss the issues of energy management strategies. (CO5,K2) 4

SECTION-C 35

4. Answer any one of the following:-

- (4.1) What are Micro Hybrid Electric Vehicles. Explain in detail.(CO1,K2) 7
- (4.2) Explain in detail Full hybrid Electric Vehicle architecture. (CO1,K2) 7

5. Answer any one of the following:-

- (5.1) Explain variable reluctance motor. Magnetic flux is said to rotate at synchronous speed why? (CO2,K2) 7
- (5.2) Explain working principle of an induction motor. Please draw the Equivalent Circuit of Induction Motor. (CO2,K2) 7

6. Answer any one of the following:-

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| (6.1) | What is mean by Ultra capacitor? Discuss the basic principle of ultra capacitor. (CO3,K2) | 7 |
| (6.2) | Compare the different energy storage technologies for Hybrid Electric Vehicles, advantages and limitations. (CO3,K3) | 7 |

7. Answer any one of the following:-

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| (7.1) | Explain Torque and Power Capability of an electric machine. (CO4,K2) | 7 |
| (7.2) | Explain in detail the advantages of Human Machine Interface (HMI) in a passenger vehicle. (CO4,K2) | 7 |

8. Answer any one of the following:-

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| (8.1) | Explain in brief, the need of energy management. (CO5,K2) | 7 |
| (8.2) | Classify and Explain the different energy management strategies (CO5,K2) | 7 |

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