

Printed Page:-

Subject Code:- AMTME0222

Roll. No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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

M.Tech

SEM: II - THEORY EXAMINATION (20..... - 20.....)

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-a. A _____ is a vehicle that can run on just the engine, just the batteries, or a combination of the two. (CO1 , K1) 1
- (a) Mild Hybrid
(b) Full Hybrid
(c) Fuel Cell
(d) Assist Hybrid
- 1-b. Which of the material is used to insulate the segments of commutator? (CO2 , K1) 1
- (a) Fibre glass
(b) Plastic
(c) Mica
(d) PVC
- 1-c. When the voltage across a capacitor is tripled, the stored charge (CO3 , K1) 1
- (a) triples
(b) is cut to one-third
(c) stays the same
(d) doubles
- 1-d. The _____ of railway train is higher compared to motorcycles. (CO4 , K1) 1
- (a) friction coefficient

(b)	aerodynamic force coefficient	
(c)	wear coefficient	
(d)	Pressure	
1-e.	Energy management is a key component of (CO5 , K1)	1
(a)	Environmental management	
(b)	Carbon management	
(c)	Nitrogen management	
(d)	Water management	
2.	Attempt all parts:-	
2.a.	What are the important subsystems in an electric/hybrid vehicle? (CO1 , K1)	2
2.b.	What is Slip In Induction Motor? (CO2 , K1)	2
2.c.	Define the Fuel Cell efficiency and show the characteristics curves. (CO3 , K1)	2
2.d.	Define Electric Fraction (EF) in a propulsion system. (CO4 , K1)	2
2.e.	What is thermal protection in battery? (CO5 , K1)	2
<u>SECTION-B</u>		20
3.	Answer any <u>five</u> of the following:-	
3-a.	Classify an automobile based on transmission system and wheel drive system. (CO1 , K2)	4
3-b.	Plot and briefly explain the torque-speed characteristics of dc shunt motor during regenerative braking. (CO1 , K2)	4
3-c.	What are the requirements of an ideal traction system? (CO2 , K2)	4
3-d.	Explain the fundamental role of at least four distinct electric components commonly found in modern hybrid and electric vehicles. (CO2, K2)	4
3.e.	Explain the working principle of capacitor. (CO3 , K2)	4
3.f.	Explain and draw Torque vs Speed curve of an electric machine. (CO4 , K2)	4
3.g.	Define Energy Management Strategies (EMS) in Hybrid Electric Vehicles (HEVs). Discuss the classification of EMS based on control approaches.. (CO5 , K2)	4
<u>SECTION-C</u>		35
4.	Answer any <u>one</u> of the following:-	
4-a.	Explain the concept of regenerative braking in HEVs. How does it contribute to energy conservation compared to conventional vehicles? (CO1 , K2)	7
4-b.	How the electric power flow is controlled in an electric vehicles? (CO1 , K2)	7
5.	Answer any <u>one</u> of the following:-	
5-a.	Explain the relation between torque and supply voltage in 3 phase induction motor? (CO2 , K2)	7
5-b.	Explain the working principle of a motor. What is the direction of rotation of rotor with respect to the rotating magnetic field? (CO2 , K2)	7

6. Answer any one of the following:-

6-a. Explain about state of charge in battery and its measurement. (CO3 , K2) 7

6-b. Explain the working principle of Lithium-Metal-Hydride battery and its advantages. (CO3 , K2) 7

7. Answer any one of the following:-

7-a. Explain in detail the quantities used to measure the performance of an Electric Machine. (CO4 , K2) 7

7-b. With the help of diagram explain the vehicle networking system. (CO4 , K2) 7

8. Answer any one of the following:-

8-a. Draw the schematic diagram and explain the series HEV Drivetrain Components and their Connections. (CO5 , K2) 7

8-b. Explain the concept of predictive EMS. How does it differ from traditional EMS in terms of efficiency and adaptability? (CO5 , K2) 7

REG:JAN_JUN-2025