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Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech.

SEM: II - THEORY EXAMINATION (2021 - 2022)

Subject: Hybrid Vehicle Technology

Time: 3 Hours Max. Marks: 70

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.
2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 marks each.
3. Section B - Question No-3 is based on external choice carrying 4 marks each.
4. Section C - Questions No. 4-8 are within unit choice questions carrying 7 marks each.
5. 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. When was the first electric car invented? (CO1) 1

(a) 1900

(b) 1925

(c) 1832

(d) 1845

1-b. If the speed of a d.c. shunt motor is increased, the back emf of the motor will (CO2) 1

(a) Decrease

(b) Increase

(c) Remain same

(d) Increase then decrease

1 Why does capacitor block dc signal at steady state? (CO3) 1

(a) due to high frequency of dc signal

(b) due to low frequency of dc signal

(c) capacitor does not pass any current at steady state

(d) due to zero frequency of dc signal

1-d.	The conventional master cylinder and booster assembly is being replaced by. (CO4)	1
	(a) Actuator Control Unit (ACU)	
	(b) Hydraulic Electronic Control Unit (HECU)	
	(c) Electronic Stability Program (ESP)	
	(d) none of the above	
1-e.	The main objective of energy management is to (CO5)	1
	(a) Minimize energy cost	
	(b) Minimum environmental effects	
	(c) Maintain optimum energy procurement and utilization	
	(d) All of these	

2. Attempt all parts:-

2.a.	Define the term Castor angle. (CO1)	2
2.b.	What is the function of an exciter? (CO2)	2
2.c.	A circular solid disc of uniform thickness 20 mm, radius 200 mm and mass 20 kg, is used as a flywheel. If it rotates at 600 rpm, determine the kinetic energy of the flywheel, in Joules. (CO3)	2
2.d.	What will happen if motor is oversized? (CO4)	2
2.e.	What is the need for managerial skills in energy management? (CO5)	2

SECTION B 20

3. Answer any five of the following:-

3	Classify the electric motors drives for EV and HEV application. (CO1)	4
3	Which are the resistive forces that retard the motion of a four-wheel vehicle? Show with a diagram. (CO1)	4
3	Why Induction motors are widely used in Industries? (CO2)	4
3	What are the functions of yoke? What is the choice of material for the yoke? (CO2)	4
3.e.	Define the coefficient of fluctuation of speed and show the turning moment diagram of a car engine. (CO3)	4
3.f.	Explain MOST and FlexRay. (CO4)	4
3.g.	Write down the steps involved in ‘Energy management Strategy’? (CO5)	4

SECTION C 35

4. Answer any one of the following:-

4-a.	Explain the various power flow control modes for a series hybrid vehicle. (CO1)	7
4-b.	Show the HEV powertrain impact on transient vehicle speed (CO1)	7

5. Answer any one of the following:-

5-a.	Why the starting torque of Squirrel cage induction motor is LOW? (CO2)	7
5-b.	Explain variable relucatnace motor. Magnetic flux is said to rotate at synchronous speed why? (CO2)	7

6. Answer any one of the following:-

6	Explain in detail the Fuel Cell Thermodynamics. (CO3)	7
6	Explain the following: Battery capacity, discharge rate, state of discharge and depth of discharge. (CO3)	7

7. Answer any one of the following:-

7	Explain the Wilson type architecture in an automatic transmission? (CO4)	7
7	Explain the two main components of Electro Hydraulic brakes. (CO4)	7

8. Answer any one of the following:-

8-a.	Write short notes on? 1) Net calorific value 2) Maximum Demand 3) Contract Demand 4) Load factor (CO5)	7
8-b.	Why an energy management control system is required in an HEV? Do you think an elaborate energy management system similar to that applied to a hybrid vehicle, is required in an electric vehicle? Explain. (CO5)	7