Printed Page:- 04 **Subject Code**:- **AME0611**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (2023. - 2024

Subject: Hybrid Vehicles and Propulsion

Time: 3 Hours **Max. Marks: 100**

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 **20**

1. Attempt all parts:-

1-a. Which of the following vehicle is better for the environment? (CO1) 1

(a) Battery electric vehicle

(b) Hybrid electric vehicle

(c) Conventional fuel vehicle

(d) none

1-b. The battery electric vehicle consists of. (CO1) 1

(a) Electric motor

(b) Internal combustion engine

(c) Ic engine and electric motor

(d) none

1-c. Select the features of Hybrid Electric Vehicles (CO2) 1

(a) Idle Stop

(b) EV Drive

(c) Motor Assist

(d) Regenerative Braking

1-d. What is the definition of a hybrid car? (CO2) 1

(a) A car that runs on electricity

(b) A car that generates electricity when it brakes

(c) A car that uses two (or more) distinct power sources to propel the vehicle.

(d) A car that runs on gas

1-e. Which of the following is correct about direct current? (CO3) 1

(a) Magnitude is constant

(b) Frequency is zero

(c) Can be transported to larger distances with less loss in power

(d) Flows in one direction

1-f. What will happen if the relative speed between the rotating flux of stator and rotor of the induction motor is zero? (CO3) 1

(a) The slip of the motor will be 5%

(b) The rotor will not run

(c) The rotor will run at very high speed

(d) The torque produced will be very large

1-g. Which Battery are preferred for EV (CO4) 1

(a) Sodium-sulphur (NaS)

(b) Nickel-cadmium (NiCd)

(c) Lead-acid (Pb-acid)

(d) Lithium-ion (Li-ion)

1-h. The torque of an induction motor is. (CO4) 1

(a) Directly proportional to slip

(b) Inversely proportional to slip

(c) Proportional to the square of the slip

(d) None of the above

1-i. An induction motor is identical to. (CO5) 1

(a) D.C. compound motor

(b) D.C. series motor

(c) Synchronous motor

(d) Asynchronous motor

1-j. Which of the following is not part of energy monitoring (CO5) 1

(a) data recording

(b) data analysis

(c) energy efficiency equipment financing

(d) data reporting

2. Attempt all parts:-

2.a.	Define the term King pin inclination. (CO1)	2
2.b.	What do you mean by environment friendliness. (CO2)	2
2.c.	What do you understand by the term 'three phase' supply? (CO3)	2
2.d.	What are the two fundamental sizing constraints on an electric machine? (CO4)	2
2.e.	What is the classification of Energy Conservation Methods. (CO5)	2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a.	Explain general configuration of an automobile with necessary diagrams. (CO1)	6
3-b.	Describe the working of universal joint with appropriate diagram. List uses of universal joint in an automobile. (CO1)	6
3-c.	Compare various types of DC and AC machines used for EV applications. (CO2)	6
3-d.	Explain regenerative braking. (CO2)	6
3.e.	What do you mean by Peak Torque and Power explain. (CO3)	6
3.f.	Explain in detail the advantages of Human Machine Interface (HMI) in a passenger vehicle. (CO4)	6
3.g.	What are the techniques to improve range and performance of hybrid electric vehicles and explain with detail? (CO5)	6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a.	Explain the various power flow control modes for a series hybrid vehicle. (CO1)	10
4-b.	What is the significance of a communication network in electric/hybrid vehicles? What are the functions of the in-vehicle communication network? (CO1)	10

5. Answer any <u>one</u> of the following:-

5-a.	Explain the speed coupling in detain with examples why we use that? (CO2)	10
5-b.	Draw and explain EV configuration with battery source. (CO2)	10

6. Answer any <u>one</u> of the following:-

6-a.	Explain with applications the switch reluctance motors. (CO3)	10

6-b.	What do you understand by battery management systems? (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	Explain the parameters used for charging and discharging the lead acid battery with suitable chemical reaction. (CO4)	10
7-b.	Define the ultra high speed flywheel. Also describe the flywheel technologies used in hybrid electric vehicle with help of diagram. (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	State the procedures to design a Battery electric vehicle. (CO5)	10
8-b.	State the procedures to design a Hybrid electric vehicle. (CO5)	10