Printed Page:- **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 (20 ..... - 20 .....)

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, K1) 1

(a) Battery electric vehicle

(b) Hybrid electric vehicle

(c) Conventional fuel vehicle

(d) none

1-b. Which type of battery is used for electric vehicle? (CO1, K1) 1

(a) Lithium

(b) Lithium-ion

(c) Lead-acid

(d) none

1-c. Select the CORRECT statement about Integrated Motor Assist (IMA) hybrid system. (CO2, K1) 1

(a) Produced by Honda.

(b) This system is the basis for many series-parallel hybrid vehicles.

(c) This system is capable of instantaneously switching from one power source to another or combining the two.

(d) None of the above

1-d. The energy strategies of companies have the principle of (CO2, K1) 1

(a) restoring and preserving the environment

(b) reducing wastes and pollutants
(c) educating the people about energy conservation
(d) all of these

1-e. Phase advancers are used to improve the power factor of (CO3, K1) 1
(a) Induction motors
(b) Induction generators
(c) Synchronous motors
(d) Synchronous generators

1-f. Which of the following is a correct representation of peak value in an AC Circuit? (CO3, K1) 1
(a) RMS value/Peak factor
(b) RMS value*Form factor
(c) RMS value/Form factor
(d) RMS value*Peak factor

1-g. Blocked rotor test on induction motors is used to find out (CO4, K1) 1
(a) Leakage reactance
(b) Power factor on short circuit
(c) Short-circuit current under rated voltage
(d) All of the above

1-h. Insertion of reactance in the rotor circuit. (CO4, K1) 1
(a) Reduces starting torque as well as maximum torque
(b) Increases starting torque as well as maximum torque
(c) Increases starting torque but maximum torque remains unchanged
(d) Increases starting torque but maximum torque decreases

1-i. Slip ring motor is recommended where.(CO5, K1) 1
(a) Speed control is required
(b) Frequent starting, stopping and reversing is required
(c) High starting torque is needed
(d) All above features are required

1-j. In case the air gap in an induction motor is increased (CO5, K1) 1
(a) The magnetizing current of the rotor will decrease
(b) The power factor will decrease
(c) Speed of motor will increase
(d) The windage losses will increase

2. Attempt all parts:-

2.a. Define the term Castor angle. (CO1, K1) 2

2.b. Define power-to-weight (PWR)ratio. (CO2, K1) 2

2.c. What is an asynchronous motor? (CO3, K1) 2

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2.d.	What high inertia ratio indicates in sizing the drive system? (CO4, K1)	2
2.e.	What are the benefits of energy management? (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Explain historical development of automobile and development of interest and activity in the EV from 1890 to present day. (CO1, K2)	6
3-b.	What are the social and environmental impacts of hybrid vehicles? (CO1, K2)	6
3-c.	What do mean by aerodynamic lag? Explain in brief? (CO2, K2)	6
3-d.	Draw and explain the torque vs engine speed curve at full load (100% acceleration pedal position). (CO2, K3)	6
3.e.	1. Explain how the driver can optimize the use of the battery and engine in a PHEV to maximize fuel efficiency and reduce emissions, considering factors like charging strategy and driving style. (CO3, K3)	6
3.f.	What factors would you consider when designing or selecting a motor or generator for a particular task?. (CO4, K3)	6
3.g.	How would you incorporate uncertainties in fuel costs and battery replacement costs into an Life Cycle Cost Analysis (LCCA) model? (CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Examine and explain in detail the Range Extended Electric Vehicles (REEV). (CO1, K3)	10
4-b.	Describe how a torque converter contributes to smoother acceleration and deceleration in an automatic vehicle. (CO1, K3)	10

5. Answer any one of the following:-

5-a.	Apply the concept of energy management to explain how a hybrid vehicle optimizes fuel efficiency. (CO2, K3)	10
5-b.	How can a regenerative braking system be implemented in an electric vehicle using an electric motor? (CO2, K3)	10

6. Answer any one of the following:-

6-a.	Compare and contrast the different methods of DC motor speed control (e.g., voltage control, field weakening, armature resistance control). (CO3, K2)	10
6-b.	What are the advantages, disadvantages and applications of induction motor? (CO3, K2)	10

7. Answer any one of the following:-

7-a.	What do you understand by Fuel cell based energy storage system? Also classify all storage system with help of suitable examples. (CO4, K2)	10
7-b.	What do you understand by Super Capacitor based energy storage? Give examples. (CO4, K2)	10

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

8-a.	How would you apply State of Charge (SoC) and State of Health (SoH) information to a battery management system?. (CO5, K3)	10
8-b.	Describe the steps you would take to monitor the efficiency of an EV's charging system. (CO5, K3)	10

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