**UPES**
UNIVERSITY OF TOMORROW

## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
### End Semester Examination, May 2023

**Program Name: B.TECH-Automotive Design Engineering**          **Semester    : VI**
**Course Name      :  Hybrid Vehicles**          **Time        : 03 hrs.**
**Course Code      :  MEAD3014**          **Max. Marks: 100**
**Nos. of page(s)    : 02**

**Instructions:  Attempt All Questions. One question from section B and C have an internal Choice. Assume any missing data if required.**

### SECTION A
### (5Qx4M=20Marks)

| S. No. | Statement of question | Marks | CO |
|---|---|---|---|
| Q1 | What is DC Choppers? Explain its applicability with advantages and disadvantages. | 4 | CO1 |
| Q2 | Discuss major associated disadvantages with fuel cells. | 4 | CO1 |
| Q3 | Discuss 1. Hybrid ECU 2. Transmission ECU with suitable applications. | 4 | CO1 |
| Q4 | A Hybrid and Electric vehicle uses a 25 KW motor and 120 KW gasoline engine. Is it mild, mild hybrid or full hybrid? State the advantages and disadvantages of it by considering its hybridness. | 4 | CO2 |
| Q5 | Discuss Fuel Cells thermodynamics. | 4 | CO2 |

### SECTION B
### (4Qx10M= 40 Marks)

| Q6 | Elaborate Electric motor capabilities curve in<br>1. Continuous Rating<br>2. Peak Overload condition. | 10 | CO2 |
|---|---|---|---|
| Q7 | Perform steady-state analysis of the first quadrant (Acceleration) in Continuous conduction mode (CCM) in DC drive trains. | 10 | CO2 |
| Q8 | Discuss fuel cell efficiency and associated efficiency limits with mathematical models. | 10 | CO2 |
| Q9 | Discuss the speed vs time and acceleration vs time curve of the Japanese (JP-015) drive cycle.<br>**OR**<br>Discuss the speed vs time and acceleration vs time curve of the Extra Urban drive cycle (EUDC).<br>. | 10 | CO3 |

### SECTION-C
### (2Qx20M=40 Marks)

| Q10 | Discuss how Regenerative braking can be used as an Electronically Controlled Regenerative braking system. Explain it with a suitable diagram. | **20** | **CO3** |
|------|------|------|------|
| Q11 | Deduce the mathematical formulation of the vehicle kinetics and roadway by considering all parameters (forces, grade-ability etc.).<br>**OR**<br>Deduce a mathematical expression for the total mass of a parallel hybrid and electric vehicle (HEV) by considering all-electric acceleration capabilities. | **20** | **CO3** |