Roll No:-_____

[Time: 3:00 Hours] SEM-VI Diploma Exam 2023 (Even) (Common) (Theory) Electric Vehicles (Advance) (2000605G) [Max. Marks: 70]

- All questions are compulsory (सभी प्रश्न अनिवार्य है।)
- Marks are mentioned on the right side of each question (अंक सभी प्रश्न के दाई ओर अंकित किये है।)

Group (A) (ग्रुप - ए)

Q.1 Choose the most suitable answer from the following options. (सर्वाधिक उपर्युक्त विकल्प को चुनकर लिखें।) (1*20=20)

i. The Fuel Cell provides _____ energy but _____ power
(a) High, Low (b) modest, modest (c) modest, low (d) low, low

ii. Gradeability is defined as the maximum _____ angle that the vehicle can overcome in the whole speed range

(a) grade (b) raise (c) slope (d) plane

iii. Which strategy is not used in Energy management strategy system
(a) Optimization based (b) Rule based (c) Global optimization strategy (d) Regression method

iv. The rolling resistance of tires on hard surfaces is due to _____ in the tire material
(a) Hysterisis (b) Breakdown (c) elasticity (d) flexibility

v. Energy Storage allocation on an EV, _____ is the first consideration since it limits the vehicle range

(a) specific energy (c) specific power and specific energy
(b) specific power (d) none of these

vi. Fuel Cell use combination of

(a) Zinc Sulphur (b) Sulphur oxygen (c) Hydrogen Oxygen (d) Sodium Sulphur

vii. Which of the following is not a power source combination for Hybrid electric Vehicles

(a) ICE and Battery (b) Battery and Ultra capacitor (c) Diesel and ICE (d) Battery and Fuel Cell

viii. If the manufacturer of a 10-kWh battery recommends a maximum DoD of 60 percent, how much kWh we can use without recharging

(a) 6 kwh (b) 60 kwh (c) 600 kwh (d) 0 6 kwh

ix. Enhancing the _____ of the flywheel is the key method of increasing its energy capacity and reducing its weight and volume

(a) angular velocity (b) power density (c) characteristic (d) current

x. Rolling resistance force is given by relation

(a) FRR =μrr mg sin θ (b) FRR =μrr mg cos θ (c) FRR =μrr mg tan θ (d) FRR =μrr mg

xi. The _____ monitors and measures temperature and assures cooling is adequate for battery

(a) Hybrid ECU (b) Transmission ECU (c) ICE EMU (d) Battery management system

xii. The main causes of aerodynamic drag are _____ drag & _____ effect

(a) Shape, Skin (b) skin, shape (c) outer, inner (d) inner, outer

xiii. The series parallel hybrid systems are classified into two categories _____ & the_____

(a) Fuel Cell dominated, petrol engine dominated
(b) ICE dominated, Electrical Motor dominated
(c) Hydrogen cell dominated, petrol engine dominated
(d) Hydrogen cell dominated, gas engine dominated

xiv. In series hybrid vehicle _____ is coupled with the Internal combustion engine to produce electricity for propulsion

(a) diesel engine (b) gas engine (c) hydrogen engine (d) generator

xv. The load power can be decomposed into _____ power & _____ power

(a) super-fast, dynamic (b) ultrasonic, fast (c) fast, slow (d) steady, dynamic

xvi. The rolling resistance of tires on hard surfaces is due to _____ in the tire material

(a) Hysterisis (b) Breakdown (c) elasticity (d) flexibility

xvii. Vehicle-to-grid (V2G) describes a system in which plug-in electric vehicles (PEV), communicate with the _____ to sell demand response services by either returning electricity to the grid or by throttling their charging rate

(a) PEV (b) ICE vehicles (c) Power grid (d) Battery scooters

xviii. For Hybridness H=100% the vehicle is a pure _____ Vehicle

(a) Electrical (b) Mechanical (c) Gasoline (d) Hybrid

xix. Which of the following vehicle produces zero emissions

(a) gasoline vehicle (b) Electrical vehicle (c) hybrid vehicle (d) Diesel vehicle

xx. Which vehicle has the smallest number of principle components?

(a) gasoline vehicle (b) electrical vehicle (c) hybrid vehicle (d) Diesel vehicle

Group (B) (ग्रुप - बी)

Q.2 What is an electric vehicle's battery management system? 4

OR (अथवा)

Why are lithium-ion batteries used in Electric Vehicles? 4

Q.3 What is the C rating of the battery in the Electric Vehicle? 4

OR (अथवा)

What are DTC and FOC in EVs? 4

Q.4 Explain energy management system in short. 4

OR (अथवा)

Explain basic EV AC and DC Chargers. 4

Q.5 What is tractive effort? Explain aerodynamic drag in detail 4

OR (अथवा)

State and define any five key battery parameters. 4

Q.6 What are the different types of energy storage devices? Explain any one in detail. 4

OR (अथवा)

Classify energy management strategies used in hybrid electric vehicle 4

Group (C) (ग्रुप - सी)

Q.7 Working Principle of Lithium-ion Batteries? 6

OR (अथवा)

What exactly is cell balance and why is it necessary? 6

Q.8 State and define the key battery parameters (i) Battery capacity (ii) C rate (iii) SoC (iv) DoD (v) Specific Energy (vi) Energy Density 6

OR (अथवा)

Explain the terms rolling resistance and aerodynamic drag in vehicles and derive the expression for vehicle translational speed from fundamentals 6

Q.9 Explain fuel cell and flywheel as energy source elements in electric and hybrid electric vehicles 6

OR (अथवा)

State historical background of EV / HEV technology in brief. Describe the current state of the art of EV / HEV technology along with technology challenges associated with it 6

Q.10 Explain the multi-quadrant control of DC motor with suitable chopper circuit diagram. 6

OR (अथवा)

Explain the different modes of charging a battery compare them in detail 6

Q.11 With necessary diagram explain each part of the V2G electric vehicle 6

OR (अथवा)

Explain the operation any three converters for wired charging of electric vehicle. 6

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