Total No. of Questions: 6 *Total No. of Printed Pages:2*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

AU3EL06 Hybrid Vehicles

Programme: B.Tech. Branch/Specialisation: AU

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The power train of electric and hybrid vehicle system consists of _____. **1**

(a) Energy storage and charge
(b) Power converter, battery and wheels
(c) Power converter, wheels and gear
(d) Power converter, electric motor and transmission

ii. Electric vehicles are generally powered by _____. **1**

(a) Aluminium battery (b) Lead acid battery
(c) Sodium battery (d) Magnesium battery

iii. The ratio of acid and water in lead acid battery is- **1**

(a) 2:1 (b) 1:2 (c) 1:3 (d) 3:1

iv. Unit of specific energy is _____. **1**

(a) J/Kg (b) J.kg (c) Kg/J (d) Kg.J

v. Z source converter function as _____. **1**

(a) Normal inverter (b) Buck inverter
(c) Boost inverter (d) Buck-Boost inverter

vi. The load of ZSC is _____. **1**

(a) Resistive (b) Inductive (c) Capacitive (d) Either (b) or (c)

vii. What is SRM? **1**

(a) Double salient, single excited motor
(b) Single salient, single excited motor
(c) Double salient, double excited motor
(d) Single salient, double excited motor

viii. Name the position sensor used in BLDC motor. **1**

(a) Transducer (b) Actuator
(c) Hall effect (d) Pressure

ix. Slip power exist in _____. **1**

(a) Synchronous motor (b) Induction motor
(c) BLDC (d) SRM

x. In wheel motor arrangement potentially use up to _____ of generated energy. **1**

(a) 80 – 85 % (b) 90 – 95 %
(c) 95% and above (d) Less than 80%

Q.2 i. Define hybridization factor. **2**

ii. Draw and define different types of forces acting on traction. **3**

iii. Explain the characteristic curves for traction motor. **5**

OR iv. Explain historical background of EV and HEV technology involvement. **5**

Q.3 i. Differentiate capacitor and super capacitor. **2**

ii. Explain in detail about the lead acid battery for EV. **8**

OR iii. Explain fuel cell as energy source element in electric and hybrid electric vehicles. **8**

Q.4 i. What are the different modes of charging batteries. **3**

ii. Explain the process of Z-converter for battery charging. **7**

OR iii. Explain the construction and working of DC current voltage regulator. **7**

Q.5 i. Explain the v/f control scheme of induction motor drive. **4**

ii. Explain in detail about the construction and operating principle of SRM. **6**

OR iii. Derive the emf and torque equation of BLDC motor. **6**

Q.6 Attempt any two:

i. Explain the series hybrid electric drive train. **5**

ii. List all modes of operation for series-parallel hybrid vehicle and explain any one in detail. **5**

iii. Classify different AC and DC traction motor for EV technology. **5**

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Marking scheme

AU3EL06 - HYBRID VEHICLES (T)

Q.1.

i) The power train of Electric and Hybrid vehicle system consists of
d) Power converter, Electric motor and Transmission

ii) Electric vehicles are generally powered by _____
b) Lead acid battery
iii) The ratio of acid and water in lead acid battery is
b) 1:2

iv) Unit of Specific Energy is _____
a) J/kg
v) Z source converter function as _____
d) Buck-Boost inverter

vi) The load of ZSC is _____
d) Either b (or) c
vii) What is SRM?
a) Double salient, single excited motor

viii) Name the position sensor used in BLDC motor.
c) Hall effect
ix) Slip power exist in _____
b) Induction motor
x) In/wheel motor arrangement potentially use upto _____ of generated energy.
c) 95% and above

Q.2	i) Definition	2 marks
	ii) Drawing	1 mark
	Types	2 marks
	iii) Curve	2 marks
	Explanation	3 marks
OR	iv) Classification	3 marks
	Explanation	2 marks
Q.3	i) 2 points	2 marks
	ii) Diagram	3 marks
	Explanation	5 marks
OR	iii) Curve	3 marks
	Explanation	5 marks
Q.4	i) Classification	3 marks
	ii) Diagram	3 marks
	Explanation	4 marks
OR	iii) Diagram	3 marks
	Explanation	4 marks
Q.5	i) Introduction	1 mark
	Control Principle with graph	3 marks
	ii) Construction with diagram	3 marks
	Operating principle	3 marks
OR	iii) emf equation	2 marks
	Torque equation	2 marks
	Plot	2 marks
Q.6	i) Diagram	2 marks
	Explanation	3 marks
	ii) Classification	2 marks

	Explanation	3 marks
OR	iii) Flowchart DC	2 marks
	AC	3 marks

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