Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2019

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. Which of the following vehicles produces zero emissions? **1**

(a) Traditional (b) Hybrid

(c) Electric (d) Both (a) and (c)

ii. What is meant by the term regeneration? **1**

(a) It's when electricity is generated during deceleration and braking.

(b) It's when the battery is charged during engine idling.

(c) It's when the battery is recharged form the mains supply

(d) None of these

iii. How can you identify a high voltage cable? **1**

(a) They are coloured red

(b) They have the wording "high-voltage" etched in their insulation

(c) They are coloured orange

(d) All of these

iv. What voltage is likely to be available from the battery of an electric vehicle or hybrid? **1**

(a) 12v (b) 24v (c) 300v (d) None of These

v. Which of the following machine will be preferred to charge the batteries? **1**

(a) Series Generator (b) Series Motor

(c) Shunt Generator (d) Compound Generator

vi. The electric current in the motor generates **1**

(a) Heat Only (b) Magnetic Field Only

(c) Both (a) and (b) (d) Power Only

P.T.O.

vii. If the speed of a D.C. shunt motor is increased, the back emf of the motor will **1**
(a) Decrease (b) Increase
(c) Remain Same (d) Increase then decrease

viii. Why the D.C. motors are preferred for traction applications? **1**
(a) The torque is proportional to armature current.
(b) The torque is proportional to square root of armature current.
(c) The speed is inversely proportional to the torque and the torque is proportional to square of armature current.
(d) Torque and speed are inversely proportional to armature current.

ix. What makes the risk of an electric shock from a high voltage battery possibly more dangerous than that from an AC Circuit? **1**
(a) The higher voltage
(b) The lower amperage
(c) The greater available amperage
(d) Both (a) and (b)

x. Which vehicle uses a high voltage battery? **1**
(a) Electric vehicle (b) Hybrid vehicle
(c) Conventional vehicle (d) Both (b) and (c)

Q.2 Attempt any two:
i. Explain the characteristics curve for the traction motor. **5**
ii. Explain the architecture of hybrid electric drive train for the hybrid vehicle. **5**
iii. Differentiate between series and parallel hybrid electric drive trains for hybrid vehicle **5**

Q.3 Attempt any two:
i. What is the requirement of energy storage devices in electric vehicle? Explain lead acid battery for the electric vehicle. **5**
ii. Name different type of fuel cell used in electric vehicle. Explain any one with its construction detail. **5**
iii. Explain the basic principle of fuel cell and its constructional working with its neat diagram. **5**

Q.4 Attempt any two:
i. Explain the topology of high-frequency transformer based isolated charger topology. **5**
ii. Explain the process of Z - converter for battery charging. **5**
iii. Explain the construction and working of DC Current voltage regulator for charging battery. **5**

Q.5 Attempt any two:
i. Explain construction and working of Switch Reluctance Motor Drive for Electric Vehicles. **5**
ii. How the permanent magnet motors work in electric vehicle? **5**
iii. Explain the construction and working of BLDC motor for electric vehicles. **5**

Q.6 Attempt any two:
i. Explain the drive train arrangement of series hybrid electric system used in hybrid vehicle. **5**
ii. What are the advantages of hybrid electric vehicle over electric vehicle? **5**
iii. What is “Power Rating” for electric vehicle? Explain type of power rating used in electric motor. **5**

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Marking Scheme
AU3EL06 Hybrid Vehicles

Q.1

i. Which of the following vehicles produces zero emissions? **1**
(c) Electric

ii. What is meant by the term regeneration? **1**
(a) It's when electricity is generated during deceleration and braking.

iii. How can you identify a high voltage cable? **1**
(c) They are coloured orange

iv. What voltage is likely to be available from the battery of an electric vehicle or hybrid? **1**
(c) 300v

v. Which of the following machine will be preferred to charge the batteries? **1**
(d) Compound Generator

vi. The electric current in the motor generates **1**
(c) Both (a) and (b)

vii. If the speed of a D.C. shunt motor is increased, the back emf of the motor will **1**
(b) Increase

viii. Why the D.C. motors are preferred for traction applications? **1**
(c) The speed is inversely proportional to the torque and the torque is proportional to square of armature current.

ix. What makes the risk of an electric shock from a high voltage battery possibly more dangerous than that from an AC Circuit? **1**
(c) The greater available amperage

x. Which vehicle uses a high voltage battery? **1**
(a) Electric vehicle

Q.2 Attempt any two:

i.	Characteristics curve	3 marks	**5**
	Explanation	2 marks	
ii.	Architecture of hybrid electric drive train for the hybrid vehicle		**5**
	Diagram	3 marks	
	Explanation	2 marks	
iii.	Difference b/w series and parallel hybrid electric drive trains		**5**
	1 mark for each difference	(1 mark * 5)	

Q.3 Attempt any two:

i.	Requirement of energy storage devices	2 marks	**5**
	Lead acid battery	3 marks	
ii.	Name type of fuel cell	2 marks	**5**
	Any one with its construction explanation	3 marks	
iii.	Principle of fuel cell		**5**
	Diagram	2 marks	
	Principle	1 mark	
	Working	2 marks	

Q.4 Attempt any two:

i.	Topology of high-frequency transformer based isolated charger topology.		**5**
ii.	Process of Z - converter for battery charging.		**5**
	Diagram	2 marks	
	Explanation	3 marks	
iii.	DC Current voltage regulator for charging battery.		**5**
	Construction	2 marks	
	Working	2 marks	
	Diagram	1 mark	

Q.5 Attempt any two:

i.	Switch Reluctance Motor Drive for Electric Vehicles.		**5**
	Diagram	1 mark	
	Construction	2 marks	
	Working	2 marks	
ii.	Permanent magnet motors work in electric vehicle		**5**
	Diagram	2 marks	
	Working	3 marks	
iii.	BLDC motor for electric vehicles.		**5**
	Diagram	1 mark	
	Construction	2 marks	
	Working	2 marks	

Q.6 Attempt any two:

i.	Drive train arrangement of series hybrid electric system used in hybrid vehicle.		**5**
	Diagram	2 marks	
	Explanation	3 marks	
ii.	Advantages of hybrid electric vehicle over electric vehicle		**5**
	1 mark for each advantage	(1 mark * 5)	
iii.	"Power Rating" for electric vehicle	2 marks	**5**
	Explanation	3 marks	

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