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Code No: 157BK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, January/February - 2023

ELECTRICAL AND HYBRID VEHICLES

(Electrical and Electronics Engineering)

Time: 3 Hours **Max.Marks:75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Give the classification of various electric vehicles.	[2]
b)	What are the standard features of an EV?	[3]
c)	Write the different train topologies used in EVs.	[2]
d)	Give the basic concept of hybrid traction.	[3]
e)	What is a drive train? Give its need in EVs.	[2]
f)	Explain drive system efficiency.	[3]
g)	What is sizing the propulsion motor?	[2]
h)	What are different modes of charging batteries?	[3]
i)	List various energy management strategies.	[2]
j)	What are the major issues in energy management of EHVs?	[3]

PART – B

(50 Marks)

2.a) Give the conditions needed for choosing a pure EV when compared with hybrid vehicles including the impact of climate changes?
b) Based on power source configuration explain the EV drive train alternatives. [5+5]

OR

3. State and explain the dynamic equation of vehicle motion. [10]

4. Give different architectures of hybrid electric drive trains and explain the series hybrid electric drive train. [10]

OR

5.a) Explain constant power speed operation mode to an electric motor.
b) Discuss about the typical value of Induction Motors used in HVE applications. [5+5]

6.a) Explain in detail about the controlling of permanent magnet motor drives.

b) Discuss the working and control of Switched Reluctance motors. [5+5]

OR

7.a) Discuss the suitability of DC and AC machines for electric and hybrid electric vehicle applications.

b) Write a short note on v/f controlled induction motor drive with in field weakening mode and constant torque mode. [5+5]

8. A 12V battery pack is connected to series RL load with L=110mh. The battery pack has rated capacity of 120Ah. At t=0 switch is closed and the battery begins to discharge. Calculate and plot the battery discharge current i(t), if the steady state discharge is C/5. Neglect voltage drop, also calculate the SoC assuming that t=0, the battery is charged to rated capacity. Calculate the time according to 70% DoD, assume t>>100ms. [10]

OR

9.a) Explain the working principle of a fuel-cell and its analysis.

b) What is the need for gear system in ICE? Explain with relevant characteristic curves. [5+5]

10. Elaborate energy management system and issues of energy management strategies of EHV. [10]

OR

11. Explain the procedure for design of a Hybrid Electric Vehicle (HEV). [10]

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