



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A+' Grade)

Subject code: 3E7BB

B.Tech VII Semester Supplementary Examinations, April 2024

**HYBRID ELECTRICAL VEHICLES
(Electrical and Electronics Engineering)**

Maximum Marks: 70

Date: 30.04.2024 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10X2M=20 Marks)

- 1 Write the present technological trends of EVs/EHVs.
- 2 Write the advantages of a hybrid electric vehicle over electric vehicles.
- 3 Write the classification of electric motors used for electric and hybrid electric vehicles.
- 4 List Various Components of HEV Drive train?
- 5 List the types of control of DC Motor drives
- 6 What is the need of drive train in EVs?
- 7 Mention the advantages of fuel cell EVs
- 8 What is meant by communication in EVs?
- 9 What is the purpose of energy management?
- 10 Write the use of control area network in electric vehicles.

Part-B

Answer All the following questions

(5X10M=50Marks)

- 11 Draw a general lay out of an EV and discuss the transmission characteristics. [10]
OR
- 12 Describe the mathematical models to determine vehicle performance. [10]
- 13 Dissect the environmental importance of EV and their social impacts. [10]
OR
- 14 With the help of a neat block diagram explain different subsystems of electric drive train. [10]
- 15 Explain the configuration of v/f-controlled induction motor drive with field- weakening mode and constant-torque mode. [10]
OR
- 16 A DC separately excited motor is powered by a dc-to-dc converter from a 600 volts dc source. The armature resistance is 0.05Ω . The back emf constant of the motor is $1.527 \text{ V/A rad/sec}$. The average armature current is 250 amps. The field current is 2.5 amps. The armature current is continuous and has negligible ripple. If the duty cycle of the converter is 60%, determine (a) the input power from the source, (b) the equivalent input resistance of the dc-dc converter drive, (c) the motor speed, and (d) the developed torque. [10]

- 17 a) Why a gear system is needed for an ICE? Explain with relevant characteristic curves. [5]
b) Explain the working principle of a fuel-cell and its analysis. [5]

OR

- 18 a) What is meant by Peukert capacity of a battery? What is its significance? [5]
b) What are different modes of charging batteries? Compare them in detail. [5]
- 19 Why an energy management control system is required in an HEV? Do you think an elaborate energy management system similar to that applied to a hybrid vehicle, is required in an electric vehicle? Explain. [10]

OR

- 20 Explain fuzzy logic implementation of energy management system in a parallel HEV with induction motor and ICE with an objective of reduction in environmental pollution with the help of a block diagram. [10]