R22 Regulation *Subject code: 4P7BC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VII Semester Supplementary Examinations, May 2026

ELECTRIC AND HYBRID VEHICLES

(EEE)

Maximum Marks: 60 Date:07.05.2026 Duration: 3 hours

Note: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
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 (10X1M=10 Marks)		Marks	CO	BTL
1.a)	What is aerodynamical drag?	1M	1	1
b)	What is the significance of gradient resistance force?	1M	1	1
c)	Draw the block diagram of parallel hybrid system of HEV	1M	2	1
d)	Define Fuel Efficiency in HEV drive trains.	1M	2	1
e)	What is drive system efficiency?	1M	3	1
f)	What is the significance of DSP Controller in SRM Motor?	1M	3	1
g)	What is Hybridization of Energy storage systems?	1M	4	1
h)	Define Specific Energy and Specific Power.	1M	4	1
i)	How do energy management strategies affect fuel economy and emissions in HEVs?	1M	5	1
j)	Why is real-time energy management critical in HEVs?	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2 (a)	Discuss the factors influencing vehicle power source characterization and their impact on performance.	5 M	1	2
(b)	List and explain the advantages and disadvantages of a Conventional Vehicle.	5 M		2
	OR			
3 (a)	Explain the characteristics of electric vehicle.	5 M	1	2
(b)	Explain the concept of gear ratio and how it affects vehicle performance.	5 M		2
4 (a)	Explain the architecture and power flow of series HEV with a neat block diagram	5 M	2	2
(b)	Discuss the evolution of electric vehicles from the 19th century to the modern era	5 M		2
	OR			
5 (a)	Explain the architecture and power flow of parallel HEV with a neat block diagram	5 M	2	2
(b)	Explain the power flow of a complex HEV with a neat block diagram	5 M		2

6 (a)	List and explain the major electrical components and choices for an Electric Vehicle system.	5 M	3	2
(b)	Explain combined armature and field control method of speed control in DC Motor drives with relevant sketches.	5 M		2
	OR			
7 (a)	Explain the classification of EVs according to Energy storage technology employed	5 M	3	2
(b)	Explain Configuration and control of Switched Reluctance Motor drives.	5 M		2
8 (a)	Describe the working principle of a lithium-ion battery and discuss its advantages and limitations for EV applications.	5 M	4	2
(b)	Discuss the structure and working of a double layer supercapacitor.	5 M		2
	OR			
9 (a)	Explain the concept of flywheel energy storage and discuss its suitability for hybrid vehicles.	5 M	4	2
(b)	Explain how to match an electric machine with an internal combustion engine in a hybrid drive system.	5 M		2
10 (a)	Describe the design considerations for a Hybrid Electric Vehicle (HEV).	5 M	5	2
(b)	Classify the different types of energy management strategies used in HEVs and briefly explain each.	5 M		4
	OR			
11 (a)	Explain the importance of energy management strategies in hybrid and electric vehicles.	5 M	5	2
(b)	How do energy management strategies affect fuel economy and emissions in HEVs? Explain.	5 M		2