Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

DEPARTMENT OF MECHATRONICS

VI SEMESTER B.TECH. MECHATRONICS

END SEMESTER EXAMINATIONS, APRIL-MAY. 2024

SUBJECT: ELECTRIC VEHICLE TECHNOLOGY SUBJECT CODE: MTE 4302

(Date: 10/05/2024, Timing – 02.30 PM to 05.30 PM)

Time: 3 Hrs **Max. Marks: 50**

Instructions to Candidates: Answer all questions. Missing data may be suitably assumed and justified.

Q. No	Problem Statement	M	CO	PO	LO	BL
1A	Determine the effective power and specific fuel consumption at a Diesel engine where given data are following: Number of cylinders: z = 8, Four-stroke engine: i = 0.5, Indicated mean pressure: p_i = 7.5 bar, Compression ratio: ε = 16.5, Clearance volume of a cylinder: V_c = 150 cm^3, Revolution: n = 2100 rpm, Mechanical efficiency: η_m= 80 %, Mass flow rate of fuel: B = 10.2 g/s.	**4**	**1**	**1**	**1**	**3**
1B	Estimate the ratio of hill climbing power required by fully loaded tata ultra truck to the half loaded one. Given specification of Tata ultra-T.12 as follows: Gross vehicle weight (GVW) = 11990 Kg, Front axle weight (FAW) = 3735 Kg, Rear axle weight (RAW)= 8255 Kg, Gradeability = 33%, speed = 35 km/hr.	**4**	**1**	**2**	**2**	**3**
1C	Inspect the different energy management strategies and implementation issues of energy management strategies in EV technology.	**2**	**3**	**2**	**2**	**4**
2A	Formulate the dynamic equation for electric vehicles. Explaining in detail: tractive force, rolling resistance force, aerodynamic drag force, hill climbing force, acceleration force.	**4**	**2**	**4**	**2**	**6**
2B	Evaluate the significance of energy sources and auxiliary subsystems in electric vehicles for ensuring optimal performance.	**4**	**2**	**2**	**2**	**5**
2C	Analyse the energy management strategies used in hybrid and electric vehicles.	**2**	**3**	**1**	**1**	**4**
3A	Categorize diverse electric motors utilized in electric vehicles, considering their working principles, construction, performance characteristics, efficiency, and appropriateness for EV/HEV/FCV applications.	**4**	**3**	**2**	**2**	**4**
3B	Examine the Electronic Control Unit's (ECU) function in electric vehicles, focusing on its incorporation with diverse sensors, actuators, and communication networks.	**4**	**3**	**2**	**2**	**4**

3C	Explore the challenges and advancements in power modulator technology that influence the evolution of electric vehicle design.	**2**	**3**	**4**	**2**	**4**
4A	Critically evaluate the potential impact of ethical, and safety standards/ issues on the adoption and diffusion of EVs in the market, and strategies for mitigating any challenges or obstacles that may arise as a result.	**4**	**4**	**4**	**2**	**5**
4B	Deduce a comprehensive classification of energy management strategies (EMS) to improve the overall performance of a vehicle.	**3**	**4**	**2**	**2**	**4**
4C	Analyze different types of regenerative braking implemented in EV application.	**3**	**4**	**1**	**1**	**4**
5A	Examine the various configuration and control strategies employed in Fuel Cell Electric Vehicles (FCEVs) to optimize performance and efficiency.	**4**	**5**	**4**	**2**	**4**
5B	Identify the benefits, challenges, limitations, development, and innovation in the field of FC based vehicles.	**3**	**5**	**2**	**2**	**3**
5C	Discuss the significance of integrating fuel cell systems, energy storage solutions, and power management electronics in fuel cell vehicles to optimize performance, efficiency, and reliability.	**3**	**5**	**4**	**2**	**6**