Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

Programme Name : B.Tech ADE **Semester : VI**
Course Name : Advanced Automobile Technology **Time : 03 hrs**
Course Code : MEAD3034P **Max. Marks: 100**
Nos. of page(s) : 2

Instructions: All the questions are compulsory.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Discuss the application of carbon fiber composites in automotive components, including their limitations.	**4**	**CO1**
Q 2	Compare the properties of cast iron and aluminum in engine block manufacturing, focusing on their suitability.	**4**	**CO1**
Q 3	Describe the concept of vehicle packaging and its importance in optimizing interior space and component layout.	**4**	**CO1**
Q 4	Identify the main components of a space frame chassis and explain their significance in vehicle design.	**4**	**CO1**
Q 5	Discuss the key factors influencing the selection of materials for automotive engine components, such as pistons or cylinder heads.	**4**	**CO1**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Assess the roles of turbochargers and superchargers in enhancing engine performance, comparing their mechanisms and impact on power output. Discuss how their integration affects fuel efficiency and analyze the practical challenges, such as lag or cost, that influence their use in different vehicle types. **OR** Explore the integration of Exhaust Gas Recirculation (EGR) systems in modern engines alongside forced induction technologies like turbochargers or superchargers. Evaluate how EGR contributes to emission control while maintaining engine efficiency, and discuss the technical trade-offs or limitations that need to be addressed for optimal performance.	**10**	**CO2**
Q 7	Examine the role of steering systems in autonomous vehicles, focusing on how they work with sensors and control systems for accurate navigation. Evaluate whether current steering technologies are ready for	**10**	**CO2**

	full autonomy and discuss the key safety and technical issues that need to be solved.		
Q 8	Evaluate the impact of integrating regenerative braking systems in electric vehicles compared to traditional hydraulic braking systems. Discuss how regenerative braking improves energy efficiency and analyze the challenges of blending it with conventional brakes for consistent performance.	**10**	**CO2**
Q 9	Explore the role of VVT in meeting modern emission standards and enhancing engine versatility across different driving conditions. Evaluate whether VVT technology can balance performance and environmental goals in high-performance vehicles, and discuss the technical limitations that need to be addressed for broader application.	**10**	**CO2**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Imagine you are tasked with designing an engine that balances efficiency, emissions, and practicality for future vehicles. Compare the principles of Homogeneous Charge Compression Ignition (HCCI) and Gasoline Direct Injection (GDI) engines, and argue which technology holds greater potential for sustainable automotive propulsion. Support your argument with an analysis of their operational mechanisms, technical limitations, and real-world applicability. **OR** Explain in detail the construction, working principle, and components of a single plate clutch. Discuss the advantages and limitations of a single plate clutch in comparison to other types of clutches used in automobiles. Highlight the functional significance of materials used in the friction lining and pressure plate. Also, elaborate on how factors such as pressure distribution, engagement force, and friction coefficient influence its overall performance and durability.	**20**	**CO3**
Q 11	Explore the role of equivalent fuel efficiency as a metric for assessing the environmental and economic sustainability of electric vehicles, considering an EV with an average energy consumption of 18 kWh/100 km and a battery capacity of 70 kWh. Estimate the equivalent fuel efficiency in km/L for a 300 km trip, assuming 15% energy loss due to auxiliary systems (e.g., air conditioning), with 1 liter of gasoline = 8.9 kWh. Assess how technologies like lightweight materials (reducing vehicle weight by 8%) or improved powertrain efficiency could improve efficiency by at least 6%, supporting your analysis with numerical estimates. Discuss the limitations of current equivalent fuel efficiency calculations for EVs, particularly in real-world versus controlled conditions, and recommend one innovation or policy to improve their accuracy and relevance for promoting EV adoption.	**20**	**CO3**