

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : 81007

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Fifth/Sixth/Seventh/Eighth Semester

Mechanical Engineering

CME 394 – ADVANCED INTERNAL COMBUSTION ENGINEERING

(Common to: Mechanical Engineering (Sandwich))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is meant by abnormal combustion in SI engines?
2. Define knock. Mention two factors affecting it.
3. Give the requirements of turbocharging in CI engines?
4. Differentiate between direct and indirect injection systems.
5. What is the function of a three-way catalytic converter?
6. List the sources of oxides of nitrogen (NO_x) emissions in IC engines.
7. State the advantages of using hydrogen as an IC engine fuel.
8. Give the modifications required for an engine to use alcohol fuels.
9. Define - Homogeneous Charge Compression Ignition (HCCI).
10. What are the advantages of hybrid electric vehicles?

PART B — ($5 \times 13 = 65$ marks)

11. (a) Explain the different types of fuel injection systems in spark ignition engines with sketch.

Or

- (b) Describe the design and functioning of combustion chambers in SI engines.

12. (a) Discuss the stages of combustion in CI engines with sketch.

Or

- (b) Explain the working principle of Common Rail Direct Injection (CRDI) systems with a neat sketch.

13. (a) Explain the formation of smoke and particulate matter in IC engines and their control methods.

Or

- (b) Describe the operation of Selective Catalytic Reduction (SCR) and Diesel Particulate Filters (DPF) in emission control systems.

14. (a) Compare the properties, merits and demerits of CNG, LPG, and biodiesel as alternative fuels.

Or

- (b) Explain the utilization techniques for alcohol fuels in IC engines. Also comment it's impact on engine materials.

15. (a) Describe the working of Low Temperature Combustion (LTC) modes like RCCI.

Or

- (b) Explain the construction and working principle of fuel cell-powered vehicle.

PART C — (1 × 15 = 15 marks)

16. (a) Compare and contrast SI and CI engine combustion processes, including stages of combustion, knocking phenomena, and influencing factors.

Or

- (b) Explain in detail the current emission norms, the formation of pollutants in IC engines and modern control technologies like SCR, DPF and catalytic converters.