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Question Paper Code : 90805

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 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 × 2 = 20 marks)

1. Define spark knock.
2. What are the main factors that affect knocking in SI engine?
3. Mention the advantages and disadvantages of CRDI system.
4. What causes Variable Geometry Turbocharger failure?
5. List the causes of hydrocarbon emissions from SI engines.
6. Write the purpose of De-NO_x catalyst used in IC Engine.
7. Mention the advantages and disadvantages of using Hydrogen in SI engine.
8. Can alcohol be used for CI engines? Justify.
9. Define the concept of spark assisted HCCI engine.
10. Highlight the differences between EV and hybrid EV?

PART B — (5 × 13 = 65 marks)

11. (a) Describe the operation of multi-point fuel injection system with a neat layout. Enlist the advantages of the petrol injection system over the conventional carburettor system.

Or

- (b) Describe the function of a combustion chamber and the constructional details of different types of combustion chambers in SI engines with neat sketches.
12. (a) Describe the process of combustion in CI engines and also explain the various stages of combustion.

Or

- (b) With neat schematic explain the Diesel fuel spray formation process and define its key parameters.
13. (a) Describe the causes of oxides of Nitrogen emissions from engines. Briefly explain the formation mechanism of oxide of Nitrogen emission.

Or

- (b) With neat sketch explain how does selective catalytic reduction technique helps in reducing NO_x emissions? Brief with control mechanism involved in it.
14. (a) Explain in detail about using alcohols as alternate fuels for IC engines. Highlight their relative merits and demerits.

Or

- (b) Elucidate how Hydrogen is being used as an alternate fuel in SI engine.
15. (a) Explain the concept of Homogeneous Charge Compression Ignition (HCCI) with a neat diagram. Describe the various control mechanisms for HCCI.

Or

- (b) With a neat sketch explain the concept of Reactivity Controlled Compression Ignition (RCCI) engine. Also describe the process of combustion in RCCI engines.

PART C — (1 × 15 = 15 marks)

16. (a) What is the most challenging issue faced by the biodiesel industry? What is the future of bio diesel in India for transportation sector? Explain in detail.

Or

- (b) Explain in detail about the design considerations for Gasoline Compression Ignition (GCI) engines.
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