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**Question Paper Code : 50785**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fifth/ Sixth Semester

Mechanical Engineering

CME 394 – ADVANCED INTERNAL COMBUSTION ENGINEERING

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why chemically correct air fuel mixture is needed for internal combustion engine and their advantages?
2. List out the stages of combustion in internal combustion engine.
3. What are the advantages of turbo charging?
4. Why knocking takes place in internal combustion engine?
5. What are the causes of formation of carbon monoxide emission in IC engine?
6. List out the methods of emission measurement.
7. Alcohol fuels is better for internal combustion engine. Give the suitable reason.
8. What are the engine modifications that required for using alternate fuel in internal combustion engine?
9. Define the term fuel cells.
10. Differentiate between hybrid electric and electric vehicles.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss the various factors affecting knocking in internal combustion engine. (7)
- (ii) Differentiate between the mono-point, and multipoint injection system in internal combustion engine. (6)

Or

- (b) (i) Explain any one fuel injection systems employed in SI engine with suitable sketch. (7)
- (ii) Differentiate between the normal and abnormal combustion. (6)
12. (a) (i) With a neat sketch explain common rail direct injection systems and their functions. (7)
- (ii) Distinguish between the direct and indirect injection systems employed in CI engine. (6)
- Or
- (b) (i) Describe the spray structure and spray penetration in internal combustion engine. (7)
- (ii) Explain the importance of variable geometry turbochargers. (6)
13. (a) (i) What are the methods available to control emissions? Explain any one in detail. (8)
- (ii) Write a short note on particulate matter formation in IC engine. (5)
- Or
- (b) (i) Explain the working principle of three-way catalytic converter with suitable sketch. (7)
- (ii) Discuss the emission norms which are important for IC engine. (6)
14. (a) (i) What are the advantages of compressed natural gas when compared to liquefied petroleum gas operated IC engine? (7)
- (ii) List out the properties of various bio diesel. (6)
- Or
- (b) (i) Discuss the performance characteristics of IC engine using hydrogen fuel. (7)
- (ii) Describe the merits and demerits of bio diesel used in internal combustion engine. (6)
15. (a) (i) Explain the concept of homogeneous charge compression ignition (HCCI) engine. (7)
- (ii) Write the advantages of hybrid electric vehicles. (6)
- Or
- (b) (i) Discuss the mechanism of spark assisted HCCI compared with SI engine. (7)
- (ii) List out the advantages of reactivity controlled compression Ignition (RCCI). (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Explain the alternative fuel resources and its utilization techniques in IC engines. (8)
- (ii) What are the factors affecting the penetration of the fuel spray in CI engines? (7)

Or

- (b) (i) Discuss the mechanism of emission formation and control methods. (10)
- (ii) What are the advantages of a waste gate in turbocharger? (5)
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