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Question Paper Code : 80833

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Eighth Semester

Mechanical Engineering

ME 2041/10122 MEE 53/ME 807 — ADVANCED I.C. ENGINES

(Regulations 2008/2010)

Time : Three hours

Maximum : 100 marks

Use of approved thermodynamic tables and charts are permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the different operating conditions of an automobile SI engine and indicate the relevant Air-fuel ratios needed.
2. What is pre-ignition?
3. What is the effect of delay period on knock in CI engines?
4. List any four assumptions made in the thermodynamic analysis of CI engine combustion process.
5. What is the difference between smoke and particulate emissions?
6. How does a three way catalytic converter differ in operation compared with two way converter?
7. Can one use solid fuels for I.C engines? If so how?
8. Can alcohol be used for CI engines? Explain.
9. What is a multivalve engine? Indicate its advantages.
10. What do you understand by CRDI system? Give its salient features.

PART B — (5 × 16 = 80 marks)

11. (a) Explain in detail how the fuel jet size and venturi size of the carburetor are decided for an automotive engine. (16)

Or

- (b) Using pressure crank angle diagram ($p-\theta$) explain the different stages of normal (desirable) combustion in a SI engine. Also explain how abnormal combustion takes place using the same $p-\theta$ diagram. (16)

12. (a) Using pressure-crank angle diagram explain the different stages of combustion observed a typical CI engine. Why is it undesirable to have the fourth phase of combustion (combustion during late expansion stroke)? (16)

Or

- (b) (i) Explain from first principles how the thermodynamic model to simulate the CI engine combustion heat release is developed. What are the assumptions made in this model? (8)
- (ii) Using neat sketches explain any two types of turbo charger arrangements commonly used in multi-cylinder CI engines. (8)

13. (a) (i) Discuss briefly the HC, CO and NO pollutant formation mechanisms in a SI engine. (8)
- (ii) With a simple sketch, explain briefly the working principle of a particulate trap. (8)

Or

- (b) What are the various types of instruments used for the measurement of emissions from IC engines? With a schematic diagram, describe in detail the chemiluminescence method of measuring oxides of nitrogen. (16)

14. (a) Explain the fuel characteristics of Alcohols, CNG, LPG and Hydrogen. (16)

Or

- (b) Explain the Performance Combustion and Emission characteristics of CI engine Using Bio-diesel as a fuel. (16)

15. (a) (i) What is a lean burn engine? Explain its advantages and disadvantages. (8)
- (ii) With a neat sketch explain the operation of an electronic fuel injection system used in a SI engine. (8)

Or

- (b) (i) Explain the operation of CRDI engine with a neat sketch. (8)
- (ii) Discuss the method of obtaining the rate of heat release from engines. (8)