

M.E/M.TECH DEGREE EXAMINATIONS, DEC 2020

Third Semester

IC 18012 – Homogeneous Charge Compression Ignition Combustion in Engines

(Regulation 2018)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions**PART A - (8 X 2 = 16 marks)**

1. The firing order in the case of four cylinder inline engines is usually
(a) 1-2-4-3 (b) 1-3-4-2 (c) 1-4-3-2 (d) Either 1-3-4-2 or 1-4-3-2
2. What can be reduced by using exhaust gas recirculation (EGR) effectively?
(a) CO (b) NO_x (c) HC (d) CO and HC
3. Three-way catalytic converters reduce the emission of CO, HC, and soot.
(a) True (b) False ; Justify.
4. Which of the following is the advantage of the hydrogen as a fuel?
(a) High volumetric efficiency (b) Low fuel cost (c) No HC and CO emissions (d) Relatively safe
5. What are the two stages in CI Engine Heat Release rate curve representing?
6. Compare the NO_x Emission levels for diesel and Methanol fuelled HCCI combustion.
7. How to ensure HCCI engine operation?
8. Compare the heat release rate diagrams for conventional and MK combustion.

PART B - (4 X16 = 64 marks)

09. (a) Explain the performance and emission characteristics of an NADI concept with neat sketch. **(16)**
Explain the various challenges of HCCI engine operation with performance map.
(OR)
- (b) Explain the heat release rate curve of gasoline HCCI engine and also indicate the premixed curve for HCCI engine operation in the same curve. **(16)**
10. (a) Explain the following parameters with respect to the HCCI Engine Operations **(16)**
(i) Influence of Equivalence ratio (ii) IMEP
(iii) Combustion limits (iv) auto ignition timing

(OR)

- (b) Explain the following Combustion Timing Sensors with neat sketch? **(16)**
(i) Speed Sensor (ii) Exhaust gas Oxygen sensor (iii) Ion current In cylinder (iv) Pressure sensor (v) Optical sensor (vi) Crank Shaft Sensors (vii) Temperature sensor

11. (a) Explain the Hydrogen fuelled HCCI Engine with valve timing diagram. Also explain its Performance, Combustion and Emission Characteristics? **(16)**

(OR)

- (b) Explain the performance, combustion and Emission characteristics of an natural gas fuelled HCCI Engine concept with neat sketch? **(16)**

12. (a) (i) Explain exhaust emissions of Second generation modulated kinetics combustion concept with neat curves. **(12)**

- (ii) List out its merits and demerits with the First generation MK Combustion Systems. **(4)**

(OR)

- (b) (i) Explain the basic concept of low temperature and premixed combustion with neat schematic diagram. **(16)**

- (ii) Explain the Pressure crank angle diagram and Heat release rate curve of Modulated kinetics combustion?