

(A constituent unit of MAHE, Manipal)

# V SEMESTER B. TECH (MECHANICAL/IP ENGG.) END SEMESTER **EXAMINATIONS, NOVEMBER 2018**

## SUBJECT: THEORY OF INTERNAL COMBUSTION ENGINES AND

### EMISSIONS [MME 4036]

### **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- 1A. Describe (i) higher heating value; (ii) lower heating value; (iii) adiabatic flame (3) temperature.
- 1B. With P-v diagram, explain ideal diesel cycle. Also write the expression for (2)efficiency.
- 1C. A hydrocarbon fuel contains 86% carbon and 13% hydrogen by mass and (5) remaining is incombustible material. 25 kg of air is supplied per kg of fuel. Find the percentage of excess air. If the exhaust gases are at 1 bar and 430°C and room temperature is 30°C, find the heat carried away by exhaust gases.

Assume Cp(dry gases) = 1 kJ/kgK, Cpw = 4.187 kJ/kgK, Cp (steam) = 2.1 kJ/kgK, hfg (at 1 bar) = 2258 kJ/kg.

2A.	Briefly explain the chemical structure of petroleum.	(3)
2B.	What are the important properties which SI engine fuel possess?	(3)
2C.	Explain the following in regard to a fuel: (i) Vapour lock characteristics, (ii) crank case dilution	(4)
3A.	Explain the following terms as applied to SI engines: (i) Pre-ignition; (ii) Auto-ignition; (iii) Detonation	(3)
3B.	The compression ratio that can be used in an SI engine is limited by the detonation characteristics of the available fuel. Justify this statement.	(3)
3C.	The factors that tend to increase detonation in SI engine tend to reduce knocking in CI engine. Why? Give reasons.	(4)
4A.	How GDI engines are differ from MPFI engine? Explain.	(3)

How GDI engines are differ from MPFI engine? Explain. 4A.

4B.	Describe with a neat sketch the construction of Wankel rotary combustion engine.	(4)
4C.	Explain the working of CRDI engine.	(3)
5A.	Explain briefly the factors which affect the formation of NOx.	(3)
5B.	Explain the effect of engine load on diesel engine smoke.	(3)
5C.	How exhaust emissions are reduced by using three-way catalytic converter?	(4)

Explain the mechanism.