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Total Number of Pages: 02

**M.TECH**  
**HTPE101**

**First Semester Examination – 2013**  
**INTERNAL COMBUSTION ENGINES**

**Time: 3 Hours**  
**Max Marks: 70**

**Answer Question No.1 which is compulsory and any five from the rest.**  
**The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2x10)
- What do you mean by multifuel and dual fuel? Give two examples.
  - Differentiate between Octane and Cetane number.
  - Draw and mention the three stages of combustion phenomenon in SI engine.
  - Name four the factors which affect the process of carburetion?
  - List a few anti knock agents commonly used to petrol.
  - What do you mean by stratification?
  - What are the best metals for catalytic converter?
  - Compare the efficiency of Otto with Diesel cycle on the basis of same compression ratio and same maximum pressure.
  - What is the value of A/F at sea when A/F at as altitude is 8 and density at altitude and sea level are 0.7 and 1kg/m<sup>3</sup> respectively?
  - Why a rich mixture is required for maximum power?
- Q2 a) With the aid of a schematic diagram, explain the combustion process in a C.I. engine. (6)
- b) Explain the factors affecting the delay period in C.I. engines and summarize those (4)
- Q3 a) With a neat sketch, explain the working of a Wankel rotary engine. (5)
- b) Explain supercharging. Describe different approaches of supercharging (5)
- Q4 a) Specify the main emissions from a multi cylinder passenger car Ci engine. How is the air fuel ratio controlled so as to reduce emissions? (6)
- b) What is a driving cycle? Discuss its significance with regard to emissions. (4)
- Q5 a) Explain the fuel spray behavior and structure of diesel fuel. (4)
- b) With diagrams, explain the various types of air motion created in CI engine combustion chambers.. (6)
- Q6 An engine working on Otto cycle, having a compression ratio of 8, uses octane C<sub>8</sub>H<sub>18</sub> as a fuel. The lower heating value of the fuel is 44000kJ/kg. The air/fuel ratio is 15:1. Determine the maximum pressure and temperature reached in the cycle (a) without considering the molecular expansion and (b) with molecular expansion. Assume C<sub>v</sub>=0.71 kJ/kgK, compression follows the law  $pV^{1.3}=\text{Constant}$ , the pressure and temperature of the mixture at the beginning of the compression being 1 bar and 60°C respectively. Determine the percentage molecular expansion. (10)

Q7 a) Derive an expression for geometrical properties of reciprocating engine. (5)

b) Derive an expression for thermodynamic relations for engine processes. (5)

Q8 Write short notes (any two) (5+5)

a) Combustion charts

b) Fault diagnosis of SI engines

c) Fuel-air and Actual cycle