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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, February 2015

(2013 Scheme)

Branch : Mechanical Engineering

Stream : Thermal Science

MTC 1004 : IC ENGINE COMBUSTION AND POLLUTION

Time : 3 Hours Max. Marks : 60

***Instructions** : 1) Answer **any two** questions from **each** Module.*
*2) Charts and tables are **permitted**.*

MODULE – I

1. a) Explain why the brake mean effective pressure of a naturally aspired diesel engine is lower than that of a naturally aspirated spark ignition engine. Explain why the bmep is lower at the maximum rated power for a given engine than the bmep at the maximum torque. **5**

   b) Determine the equilibrium composition for the constant pressure combustion of $CO + \frac{1}{2} O_2$ at 3000k and 10 atm. Consider the dissociation reaction $CO_2 <----------> CO + \frac{1}{2} O_2$. **5**

2. a) Calculate the enthalpy of the products and reactants, and the enthalpy increase and internal energy increase of the reaction, of a stoichiometric mixture of methane and oxygen at 298.15 k. Take standard enthalpies of formation from tables. **4**

   b) Evaluate the work of compression and state of unburned mixture at the end of compression for a SI engine of compression ratio 8. Take the state of the mixture at the beginning of compression as 1 atm and 333 k. Use combustion charts. State all assumptions. **6**

3. Explain the following :
   i) Exhaust gas composition
   ii) Properties of mixture charts
   iii) Engine operating parameters. **(3+3+4=10 Marks)**

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MODULE – II

4. a) Explain the phenomenon of knock in CI engines and compare it with SI engine knock. 7

   b) Why is it more difficult and less appropriate to turbo charge SI engines than CI engines ? 3

5. a) Explain the essential features of combustion in SI engines. 5

   b) Derive an expression for calculating the net and gross heat release rate for an IC engine using laws of thermodynamics. 5

6. Explain the following :

   i) Flame structure and speed

   ii) Cyclic variations in combustion

   iii) Fuel spray behavior. **(4+3+3=10 Marks)**

MODULE – III

7. a) Give an account of the emission standards followed in our country. 3

   b) Why usually NOx emissions are more in biodiesel operated vehicles than diesel fuelled vehicles ? 3

   c) Explain the advantages and disadvantages of using LPG and natural gas in IC engines. 4

8. a) Discuss about the formation of Nitric oxide emissions from the IC engines. 4

   b) Explain the different sources of hydrocarbon emissions in IC engines. 6

9. Explain the following :

   i) Soot and particulate formation

   ii) CI engine emission control technology

   iii) Properties of gasoline specified in the fuel standards. **(3+4+3=10 Marks)**