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BIMEE-023

00594

B.TECH IN MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

June, 2014

BIMEE-023 : COMBUSTION ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. **All** questions carry **equal** marks. Use of scientific calculator is **permitted.***

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1. (a) What are the essential requirements to be fulfilled by a fuel injection system for CI engines ? What is the most common injection system used in multi-cylinder diesel engines ? **5+5**

(b) Distinguish clearly between "Octane Number" and "Cetane Number". What is their significance in rating of fuels for SI and CI engines ?

2. (a) What are the desirables properties of I.C. engines fuels ? **5+5**

(b) What is the difference between Higher Heating Value (HHV) and Lower Heating Value (LHV) of the fuel ?

3. (a) What do you mean by stoichiometric air-fuel (A/F) ratio ? Calculate stoichiometric air-fuel ratio of natural gas (CH_4). 5+5

(b) What are the main functions of the nozzle ? Explain different types of nozzle with neat diagram.

4. (a) State the relative advantages and disadvantages of battery and magneto-ignition systems. 5+5

(b) Explain the phenomenon of auto-ignition. Discuss how auto-ignition is responsible for knocking in S.I. engine ?

5. A gas turbine unit receives air at 1 bar and 300 K and compress it adiabatically to 6.2 bar. The compressor efficiency is 88%. The fuel has a heating value of 44186 kJ/kg and the fuel-air ratio is 0.017 kJ/kg of air. The turbine internal efficiency is 90%. Calculate the work of turbine and compressor per kg of air compressed and thermal efficiency for products of combustion, $C_p = 1.147$ kJ/kg K and $\gamma = 1.333$. 10

6. A six-cylinder, four-stroke 'Petrol engine' having a bore of 90 mm and stroke of 100 mm has a compression ratio of 7.0. The relative efficiency with reference to indicated thermal efficiency is 55% when the indicated specific fuel consumption is 0.3 kg/kWh. Estimate the calorific value of the fuel and fuel consumption (in kg/h), if imep is 8.5 bar and the speed of the engine 2500 rpm. 10

7. A six cylinder four-stroke diesel engine develops 125 kW and 3000 rpm. Its brake specific fuel consumption is 0.20 kg/kWh. Calculate the quantity of fuel to be injected per cycle per cylinder, specific gravity of the fuel may be taken as 0.85. **10**

8. (a) What do you understand by the term 'Ignition delay' ? List the factors which affect ignition delay in SI engines. **5+5**

   (b) "While volatility of the fuel is a determining factor in the selection of fuels for SI engines, ignition quality of the fuel is the primary deciding factor for CI engines". Discuss briefly the statement.

9. (a) Explain the effect of fuel viscosity on diesel engine performance. **5+5**

   (b) What are the two major reasons for incomplete combustion ? Name the major pollutants which are emitted from the exhaust due to incomplete combustion ?

10. (a) Why excess air is supplied in combustion ? **5+5**

    (b) What are the advantages of liquid and gaseous fuels over solid fuels ?