[03 – 3214]

III/IV B.E. DEGREE EXAMINATION.

Second Semester

Mechanical Engineering

ENGINEERING THERMODYNAMICS — III

(Common with Dual Degree Program in Mechanical Engineering)

(Effective from the admitted batch of 2006–2007)

Time : Three hours   Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR questions from the remaining.

All questions carry equal marks.

Answer to questions No. 1 must be at one place.

Assume suitable data wherever necessary.

1. Answer the following in brief :

    (a) State the functions of a carburetor in a petrol engine.

    (b) Give the list of methods used to suppress the knocking phenomena in S-I engines.

    (c) What is meant by ignition delay?

7. (a) Write down the advantages and disadvantages of 'photovoltaic solar energy conversion'.

   (b) How are the MHD systems are classified? Explain with a neat sketch of open cycle MHD system.

8. Write short notes on :

   (a) Magneto-ignition system

   (b) Fuels used for gas turbines

   (c) Solar collectors.

(d) What is Euler's work?

(e) What are the limitations of Gas turbines?

(f) Define the chain reaction.

(g) What is a Fuel cell?

2. (a) Compare the petrol and diesel engines.

(b) An engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.00263 m³. The initial pressure and temperature are 1 bar and 50° C. If the maximum pressure is limited to 25 bar, find the following

(i) The air standard efficiency of the cycle

(ii) The mean effective pressure for the cycle. Assume the Ideal conditions.

3. (a) What are the different methods used in C.I. engines to create turbulence in the mixture? Explain its effect on power output and thermal efficiency of the engine.

(b) What do you mean by pre-ignition? How can it be detected?

4. (a) Bring out the composition between reciprocating and rotary air compressors.

   (b) A centrifugal compressor delivers 16.5 kg/s of air with a total head pressure ratio of 4:1. The speed of the compressor is 1500 rpm. Inlet total head temperature is 20°C, slip factor 0.9, power input factor 1.04 and 80% isentropic efficiency. Calculate

      (i) Overall diameter of the impeller

      (ii) Power input.

5. (a) A gas turbine unit receives air at 1 bar and 300 k and compresses 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/kgk and $Y = 1.333$.

   (b) What are the requirements and applications of an ideal rocket propellant?

6. (a) Draw a neat diagram of CANDU type reactor and explain its working principle and give its advantages over the other types.

   (b) Write a short note on "pollution from nuclear power plants" and what are the various methods used to storage or disposal of radioactive waste materials?