Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(IE) (2008/09 Batch)/(ME) (Sem.–3)

APPLIED THERMODYNAMICS–I

Subject Code : ME-209

Paper ID : [A0805]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write short notes on :

(a) Why excess air is supplied for combustion?

(b) What is the function of fusible plug in boiler?

(c) Differentiate between conventional and high pressure boilers?

(d) What is the function of condenser in power plant?

(e) What is degree of reaction?

(f) State isothermal efficiency of a reciprocating compressor.

(g) Explain clearly the equivalent evaporation from and at 100°C.

(h) What do you mean by the stage efficiency and overall efficiency of Impulse turbine?

(i) What is bleeding and what for this is carried out?

(j) Explain the effect of friction in nozzles.

SECTION B

2. Calculate the minimum quantity of air required for complete combustion of lm3 of gaseous fuel which has the following composition by volume :

   H_2=30%., CH_4=40%, CO=15%, CO_2=5%, O_2=2% and N_2=8%.

3. Describe construction and working of any one high pressure boiler with sketch.

4. Explain the phenomenon of "Super saturation" in Nozzle with the help of H-s and T-s charts.

5. What is the effect of air leakage in a condenser? Explain the working of air extraction pump with neat sketch.

6. Explain the reasons for shifting to multistage compression for reciprocating compressors, and its advantages.

SECTION C

7. A five stage steam turbine has steam entering at 20 bar, 300°C and leaving at 0.05 bar and 0.95 dry. Determine the Reheat factor, condition of steam at exit from each stage considering efficiency ratio (ηs) = 0.555 and all stages doing equal work.

8. A steam nozzle is supplied with steam at 15 bar and 350°C and discharges steam at 1 bar. If the diverging portion of nozzle is 80 mm long and throat diameter is 6 mm. Determine the cone angle of the divergent portion. Assume 12% of total available enthalpy drop is lost in friction in divergent portion. Also determine the velocity and temperature of steam at throat.

9. A two stage single acting compressor takes in air at the rate of 0.2m^3/s. The intake pressure and temperature of air are 0.lMPa and 16°C. The air is compressed to a final pressure of 0.7MPa. The inter cooling is perfect and the intermediate pressure is for minimum work input conditions. The compression index in both the stages is 1.25 and compressor runs at 600r.p.m. Neglecting clearance, determine :

   (a) intermediate pressure,

   (b) total volume of each cylinder,

   (c) the ower required to drive compressor and total heat rejected in intercooler. Take C_p=1.005kJ/kg K and R=0.287 kJ/kg K.