Roll No. ☐☐☐☐☐☐☐☐☐☐☐ Total No. of Pages : 02

Total No. of Questions : 09

B. Tech. (ME-2011 Batch) (Sem.–3rd)
APPLIED THERMODYNAMICS-I
Subject Code : BTME-304
Paper ID : [A1141]

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

l. Answer briefly :

(a) Explain the phenomenon of knock in C.I. engines.

(b) Define quality of steam and superheated steam.

(c) What are boilers accessories ?

(d) Sketch Rankine cycle on T – S & h – S planes.

(e) What is the significance of critical pressure ratio?

(f) Explain the effect of blade friction on velocity diagram in case of steam turbines.

(g) What are fire tube boilers ? Name any two of these.

(h) Why compounding of steam turbines is done ?

(i) Explain the terms reheat factor and overall efficiency used for reaction impulse turbine.

(j) What are the various elements of condensing unit?

SECTION-B

2. Explain the effect of engine variables on delay period.

3. Explain with sketch the working of fusible plug.

4. What is the effect of regeneration on the specific out, mean temperature of heat addition, cycle efficiency and steam rate. Explain.

5. Derive the expression for critical pressure ratio in flow through steam nozzle. Give physical explanation.

6. For what purpose is the steam jet air ejector suitable ? Discuss the working principle of a two stage steam jet ejector.

SECTION-C

7. A blast furnace gas has the following volumetric composition $CO_2 = 11\%$; $CO = 27\%$; $H_2 = 2\%$ and $N_2 = 60\%$. Find the theoretical volume of air required for the complete combustion of 1 m^3 of the gas. Find also the percentage composition of dry flue gases by volume. Assume that air contains 21% of O_2 & 79% of N_2 by volume.

8. The total tangential force on one ring of Pearson's turbine is 1200 N, when the blade speed is 100 m/s. The mass flow rate is 8 kg/s. The blade outlet angle is 20°. Determine the steam velocity at outlet from the blades. If the friction losses which would occur with pure impulse are 25% of the kinetic energy corresponding to the relative velocity at entry to each ring of blades and the expansion losses are 10% of the heat drop in the blades, determine the heat drop per stage and the stage efficiency.

9. Explain with sketch the constructional details and working of Cochran Boiler.