

Class: BE (Chemical) Semester 7th

Subject: Plant Utilities

Total marks: 18

Date: 19.10.21

Time : 1 hour

INSTRUCTIONS: Attempt all questions. Free hand diagrams may be drawn but must be labelled.

(i) What is the importance of clearance volume? Compare the polytropic, adiabatic and isothermal work input in case of reciprocating air compressor. A single stage reciprocating air compressor has a piston development of 0.05m^3 . Air is sucked by the compressor at 2 bar 20°C . The air after compression to 8 bar is delivered to the receiver at constant pressure. If the compression is assumed to be isentropic then determine work done by air during suction, compression and during air delivery. (6)

(ii) Compare the IC engine and gas turbines. A simple closed gas turbine plant receives air at 1 bar and 15°C and compresses it to 5 bar and the heats it to 800°C in the heating chamber. The hot air expands in a turbine back to 1 bar. Calculate the power developed per kg of air supplied per second. Take C_p for the air as 1kJ/kg . (6)

(iii) Why and where the high pressure boilers are used? Compare the fire tube and water tube boilers. (6)