

III B.Tech I Semester Supplementary Examinations, May 2005
THERMAL ENGINEERING - II
(Mechanical Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. Steam at a pressure of 15 bar and 250°C is expanded through a turbine at first to a pressure of 4 bar. It is then reheated at constant pressure to the initial temperature of 250°C and is finally expanded to 0.1 bar. Estimate the work done per kg of steam flowing through the turbine, and the efficiency. Compare these values when there is a single expansion from 15 bar to 0.1 bar without any reheat. Assume all expansion processes to be isentropic and neglect the pump work. Plot the cycle on T-s plot.
2. (a) Calculate the throat and exit diameters of a convergent-divergent nozzle which will discharge 820 Kg of steam per hour. from a pressure of 8 Bar superheated to 220°C into a chamber having a pressure of 1.5 Bar. The friction loss in divergent portion of the nozzle may be taken as 0.15 of the total enthalpy drop.
(b) Discuss the importance of the divergent portion of the convergent - Divergent Nozzle
3. (a) What are the reasons for inefficiency in surface condenser?
(b) A surface condenser is designed to handle 10,000 Kg of steam per hour. The steam enters at 0.08 Bar and 0.9 dryness and the condensate leaves at corresponding saturation temperature. The pressure is constant through out the condenser. Estimate the cooling water flow rate per hour, if the cooling water temp. Rise is limited to 10°C .
4. In a Delaval turbine, the steam issues from the nozzles with a velocity of 850m/s. the nozzle angle is 20° . Mean blade velocity is 350m/s. the blades are equiangular. The mass flow rate is 1000kg/min. friction factor is 0.8. determine:
(a) Blade angles
(b) Axial thrust on the end bearing
(c) Power developed in kW
(d) Blade efficiency
(e) Stage efficiency, if nozzle efficiency is 93%
5. (a) What do you mean by compounding of steam turbines? Discuss various methods of compounding steam turbines?
(b) Explain the difference between an impulse turbine and a reaction turbine?
6. (a) Derive the expressions for efficiency and specific work output of a simple gas turbine cycle in terms of pressure ratio.

- (b) What is the difference between tubular and Annular type combustion chambers for gas turbines.
 - (c) What is overall efficiency of a gas turbine plant.
7. (a) What do you mean by jet propulsion? Explain the Various devices in a jet propulsion unit.
- (b) Prove that the propulsion of a rocket motor is obtained is
- $$\eta_p = 2(C_a/C_{je})/(1 + (C_a/C_{je})^2)$$

Where C_a =flight speed

C_{je} =effective jet velocity of rocket motor.

8. Discuss the theory of the rocket engine.
