Code No: **R31034**   **R10**   Set No. 1

III B.Tech I Semester Supplementary Examinations, November - 2015
THERMAL ENGINEERING-II
(Com.To. ME,AME)

Time: 3 hours   Max. Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1 a) Show Rankine cycle on P-V and T-S diagram using dry saturated steam and obtain an expression for the Rankine cycle efficiency.   [8]

   b) Steam at a pressure of 15 bar and at a temperature of 300^0C is supplied to a steam turbine working on the Rankine cycle. If the exhaust takes place at 0.15 bar, Evaluate the Rankine efficiency. Calculate the steam consumption in Kg/h to develop 750 KW, if efficiency ratio is 0.6.   [7]

2 a) Explain the working of super heater with the help of neat sketch.   [5]

   b) A chimney has a height of 60 meters. The temperature of air is 27^0C. Find the draught in mm of water when the temperature of chimney gases is such as to cause the mass of these gases discharged in a given time to be maximum.   [10]

3 a) Draw the discharge versus ratio of pressures at outlet to inlet curve for a convergent steam nozzle. Discuss the physical significance of critical pressure ratio.   [5]

   b) The throat diameter of the nozzle is 5mm. If dry and saturated steam at 10 bar is supplied to the nozzle, Calculate the mass flow per second. The exhaust pressure is 1.5 bar. Assume friction less adiabatic flow and index of expansion n=1.135. If 10 percent of the isentropic heat drop is lost in friction, what should be the correct diameter at outlet for steam to issue at the same exhaust pressure.   [10]

4   A De-Lavel turbine is supplied with dry steam and works on a pressure range from 10.5 bar to 0.3 bar. The nozzle angle is 20^0 and the blade exit angle is 30^0. The mean blade speed is 270m/s. If there is a 10% loss due to friction in the nozzle and the balde velocity coefficient is 0.82, find the thrust on the shaft per KW power developed.   [15]

5   In a reaction turbine pair, the fixed and moving blades are of the same shape but reversed in direction. The angles of the receiving tips are 35^0 and of discharging tip 20^0. The mean velocity of the blades is 37.5 m/s and the steam flows at the rate of 64kg/s. If the isentropic heat drop for this turbine pair is 6KJ/kg. Calculate the diagram power and efficiency of the pair.   [15]

6 a) What are the functions of condenser in a steam plant.   [5]

   b) The vacuum gauge on a condenser reads 655 mm of Hg at a barometric pressure of 760 mm of Hg. Steam condenses at 48^0C. Find the ratio of mass of water vapour(steam) to air to be dealt by dry air pump. If the air leakage into the condenser were reduced by 50%, find the resulting alteration in vacuum in mm of Hg.   [10]

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7 a) Write a short note on semi-closed cycle gas turbine.   [5]

   b) A gas turbine takes in air at 27^0 C and 1 bar. The pressure ratio is 4 and the maximum [10]
       temperature in the cycle is 560^0C. The compressor and turbine efficiencies are 0.83 and
       0.85 respectively. Determine the overall efficiency if the regenerator effectiveness is 0.75.

8 a) List out the differences between the jet propulsion and rocket propulsion.   [5]

   b) The following data pertain to a turbo-jet flying at an altitude of 9500m Speed of the turbo [10]
       jet=800 km/hr, Propulsive efficiency=55%, Overall efficiency of the turbine plant=17%,
       Density of air at 9500 m altitude=0.17 kg/m^3, Drag on the plane=6100N. Assuming
       calorific value of the fuels used as 46000KJ/kg. Calculate Absolute velocity of the jet (ii)
       Volume of air compressed per min (iii) Diameter of the jet   (iv) Power output of the unit
       (v) Air-fuel ratio.

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