Exercises

Problem (6.1) The steam at 100 bar and 500°C is supplied to a steam turbine of 30 MW capacity. The vacuum maintained in the condenser is 71 cm of Hg when the barometer reads 76 cm of Hg. The steam coming out of the turbine is condensed in a surface condenser using river water for cooling. The rise in temperature of the cooling water is limited to 10°C. The temperature of the water at the inlet of the condenser is 20°C. The condensate comes out of condenser as saturated liquid. Find (a) the mass of steam supplied to the turbine per hour, (b) Capacity of the pump to circulate water, (c) the heat transfer area of the condenser if the overall heat transfer coefficient is 400 W/m^2°C.

Ans.[(a) 22.5kg/s, (b) 926.6 kg/s, (c) 7,135 m^2]

Problem (6.2) A steam turbine develops 3000kW when the steam is supplied at 10 bar and 250°C. The vacuum in the condenser is maintained at 65 cm of Hg. The barometric reads 75.2 cm of Hg. The rise in temperature of cooling water is limited to 15°C. The temperature of the condensate coming out of condenser is 35°C. Find, (a) specific steam consumption of the plant, and (b) quantity of cooling water circulated through the condenser per hour. Assume there is no leakage in the condenser.

Ans.[(a) 4.8 kg/kW.h, (b) 447 tons/h]

Problem (6.3) The following data for steam condenser: Steam condensed = 50000 kg/h; Temperature of steam in condenser = 40 ^{o}C; Dryness of steam entering into condenser=0.85; The air leakage in the condenser = 150 kg/h; Temperature of the condensate = 35^{o}C. Find: (1) The air leakage pressure. (2) Quantity of cooling water passed through the condenser per hour if the rise in cooling water temperature is limited to 10^{o}C

Ans. [(1) 0.0163 kPa, (2) 587 tons/h]