

- b) A steam turbine is supplied with dry saturated steam at 20 bar . The exhaust takes place at 0.3 bar. For a flow rate of 10 kg/s. Calculate
 i) Quality of steam at the end of expansion ii) Power required to drive the pump
 iii) Turbine power iv) The Rankine efficiency v) The heat flow in the condenser (10)
- 5) a) What is an irreversibility? State it's types and causes (6)
- b) Air enters a compressor in a steady flow at 140 KPa, 17° C & 70 m/s and leaves at 350 KPa, 127 °C & 110 m/s. The environment is at 100 KPa, 7°C. Calculate per kg of air-
 (i)The actual amount of work required (ii)The minimum work required
 (iii)The irreversibility of the process (10)
- c) Calculate the enthalpy, volume and entropy of 2 kg of steam at a pressure of 1.9 MPa having the dryness fraction of 0.85. (4)
- 6) a) Prove that the entropy is the property of system (4)
- b) 1 Kg of Nitrogen gas at 1 bar and 300K is compressed to 5bar and 400K. Find i) Index of process ii) Work Transfer iii) Heat transfer iv) Change in internal Energy (6)
- c) Liquid octane C_8H_{18} at 25°C is used as a fuel. Air used is 140 % of theoretical air & is supplied at 25°C. Assume a complete combustion & the product leaves the combustion chamber at 1500 K. Find the transfer per kg mole of fuel. Use the following data: (10)

substance	h_f^0 (MJ/K mol)	h_{298K} (MJ/K mol)	h_{1500k} (MJ/K mol)
C_8H_{18} (Liquid)	-250	-	-
O_2	-	8.68	49.29
N_2	-	8.67	47.07
H_2O (gas)	-241.8	9.90	57.99
CO_2	-393.5	9.36	71.078