Code No: 125ER

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, February - 2022
THERMAL ENGINEERING - II
(Common to ME, AME)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Describe about adiabatic flame temperature with neat sketch.
b) Describe about the Rankine cycle with P-v diagram and T-s diagram and derive the efficiency of Rankine cycle. [7+8]

2.a) Explain about the Locomotive boiler with a neat sketch.
b) Steam is supplied to a nozzle at 3.5 bar and 0.96 dry. The steam enters the nozzle at 240 m/s. The pressure drops to 0.8 bar. Determine the velocity and dryness fraction of the steam when it leaves the nozzle. [7+8]

3. The steam supply to an impulse turbine with a single row of moving blades is 2 kg/s. The turbine develops 130 kW, the blade velocity being175 m/s. The steam flows from a nozzle with a velocity of 400 m/s and the velocity coefficient of blades is 0.9. Find the nozzle angle, blade angle at entry and exit, if the steam flows axially after passage over the blades. [15]

4. A gas turbine plant consists of two stage compressor with perfect intercooler and a single stage turbine. If the plant works between the temperature limits of 300 K and 1000 K and 1 bar and 16 bar. Find the net power of the plant per kg of air. Take specific heat at constant pressure as 1 kJ/kg K. [15]

5. A turbo-jet engine flying at a speed of 960 km/h consumes air at the rate of 54.5 kg/s. Calculate: (a) Exit velocity of jet when the enthalpy change for the nozzle is 200 kJ/kg and velocity –coefficient is 0.97 (b) fuel flow rate in kg/s when air-fuel ratio is 75:1 (c) Thrust specific fuel consumption (d) Thermal efficiency of the plant when the combustion efficiency is 93% and calorific value of the fuel is 45000 kJ/kg (e) Propulsive power (f) Propulsive efficiency (g) overall efficiency. [15]

6.a) Describe with a sketch a low level jet condenser of the counter flow type.
b) In a chimney of height 50 meters, temperature of fuel gases with natural draught is 367 ^{0}C. The temperature of waste gases by using artificial draught is 127^{0}C. The temperature of outside air is 27 ^{0}C. If air supplied is 19 Kg/kg of fuel burnt, determine the efficiency of chimney. Assume Cp=1.005 KJ/kg K for the gases. [7+8]

7.a) List out the differences between the impulse turbine and reaction turbine.
b) The throat diameter of the nozzle is 4mm. If dry and saturated steam at 8 bar is supplied to the nozzle, Calculate the mass flow per second. The exhaust pressure is 2 bar. Assume frictionless adiabatic flow and index of expansion n=1.135 . [7+8]

8.a) Discuss the differences between the jet condensers and surface condensers.
b) Explain the working of the propeller jet with a neat sketch. [7+8]

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