R09

Code No: 55020

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2017
APPLIED THERMODYNAMICS-II
(Common to AME, ME)

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

Answer any five questions
All questions carry equal marks

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1.a) Explain the analysis of flue gases by using Orsat Apparatus.
b) Volumetric composition of gas is:
$CO_2 = 2.5\%$; $N_2 = 1.5\%$; $CH_4 = 73.5\%$; $C_2H_6 = 22.5\%$
It is supplied with 25% excess air for combustion, Determine: (i) Dry gas analysis based on CO_2 , O_2 and N_2. (ii) Total volume of gas for complete combustion at 300^0C and 1.01325 bar. [7+8]

2.a) Explain the function of economiser in a steam boiler installation.
b) Explain the term "Chimney Efficiency" and derive equation for the same. [7+8]

3.a) Explain the physical significance of Wilson's line as referred to super-saturated flow through steam nozzles.
b) Steam expands through a nozzle adiabatically and reversibly from 8 bar and 220^0C to a final pressure of 3 bar. Determine the final condition of steam and exit velocity. [7+8]

4.a) Derive an expression for maximum blade efficiency in a single stage impulse steam turbine.
b) Steam issues from the nozzles of a De Laval turbine with a velocity of 1000m/sec. The nozzle angle is 20^0. Mean blade velocity is 400m/sec. The blades are symmetrical. The mass flow rate is 1000Kg/hr. Friction factor is 0.8. Efficiency of nozzle is 0.95. Determine (i) Blade Efficiency (ii) Power developed. [7+8]

5. In a parsons reaction turbine, the fixed and the moving blades are of the same shape. The moving blade angles at entry and exit are 35^0 and 20^0 respectively. Determine the power developed force steam flow rate of 1.5kg/sec and the blade speed of 75m/sec. Determine also the stage efficiency of enthalpy drop over the stage is 20KJ/Kg. [15]

6.a) What are the sources of air leakage into the condenser? Explain also the need for separate pump for extraction of air and water.
b) A condenser has 50mm Hg absolute pressure. The air-Vapour mixture has been cooled to 25^0C. In an air cooler section of the condenser. Determine the capacity of the ejector to handle 0.085m^3/min of free air leakage in the condenser. Free air conditions are 1.01325 bar and 15^0C. [7+8]

7.a) Discuss the methods of improving work ratio, specific output and cycle thermal efficiency by employing multistage system gas turbines with inter cooling and reheating.

b) A gas turbine plant coorks between the temperature limits of 1152K and 288K. Isotropic efficiencies for compressor and turbines are 0.85 and 0.8 respectively. Determine the optimum ratio for maximum work output and also for maximum cycle thermal efficiency. [7+8]

8.a) Define the following terms related to Jet Engine (i) Specific Thrust (ii) Thermal Efficiency (iii) Propulsive Efficiency

b) Explain the methods of Thrust Augmentation in Jet Engines.

c) Explain the working principle of Rocket Engines. [5+5+5]

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