

R09

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year I Semester Examinations, November/December-2013

APPLIED THERMODYNAMICS-II

(Common to AME, ME)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Draw the lay out, P-V & T-S diagrams of Rankine cycle and its working in detail.
- b) Discuss about adiabatic flame temperature. [15]
- 2.a) Define equivalent evaporation and boiler efficiency
- b) Explain all the 3-types of mechanical draught systems with neat sketches. [15]
- 3.a) Derive the equation which provides criteria to decide nozzle shape.
- b) Steam enters a group of nozzles of a steam turbine at 12 bar and 220°C and leaves at 1.2 bar. The turbine develops 150 kW with specific steam consumption of 12 kg/kW-hr. If diameter of nozzles at throat is 10 mm; calculate the number of nozzles. [15]
- 4.a) Draw velocity triangles of an impulse turbine and derive expressions for
 - i) Force on rotor
 - ii) Work done on blade
 - iii) Power developed
 - iv) Axial thrust on rotor
- b) Derive the expression for blading or diagram efficiency. [15]
5. In a stage of impulse reaction turbine operating with 50% degree of reaction, the blades are identical in shape. The outlet angle of moving blade is 19° and discharge velocity of steam is 100 m/s in a direction at 100° to motion of blades. If the rate of flow of steam is 15000 kg/h, find power developed in kW. [15]
- 6.a) With a neat sketch explain working of evaporative condenser
- b) What are the various sources of air leakage into the condenser? And what are the effects of air? [15]
7. In a gas turbine cycle, the pressure ratio is 6 and maximum cycle temperature is 650°C . The efficiencies turbine and compressors are 0.85 and 0.82. Air enters the compressor at 15°C and flow rate of air is 12kg/sec. For compression process, $c_p=1.005\text{ kJ/kg-K}$; $\gamma=1.32$. For combustion process, $c_p=1.11\text{ kJ/kg-K}$. Determine
 - a) Power developed
 - b) Thermal Efficiency.
 - c) Work ratio. [15]
- 8.a) Explain liquid propellant rocket with a neat sketch.
- b) Describe various thrust augmentation techniques used in turbo-jet engine? [15]
