

11/12 mech

R09

Code No: 09A30305

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, June/July-2014

THERMODYNAMICS

(Common to ME, AE, AME)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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Note: Use of steam tables permitted

- 1.a) Explain quasi static process.
- 1.b) Distinguish between reversible and irreversible processes.
- 1.c) Explain the difference between path function and point function.
  
- 2.a) Apply the steady flow energy equation to:
  - i) Nozzle
  - ii) Steam turbine
  - iii) Air compressor.
- 2.b) Air at a pressure of 50 bar and volume of 0.2 m<sup>3</sup> is expanded at constant pressure until the volume is doubled. It is then expanded according to  $p v^{1.35} = \text{constant}$  until the volume is 0.8m<sup>3</sup>. Calculate the work done in each process.
  
- 3.a) Explain the Kelvin-plank and Clausius statements of second law of Thermodynamics.
- 3.b) One kg of air initially at 10 bar pressure and 400 K temperature expands according to the law  $p v^{1.28} = \text{constant}$  until the pressure is reduced to 2 bar. Determine:
  - i) Final specific volume and temperature
  - ii) Change in internal energy
  - iii) Work done
  - iv) Heat transfer
  - v) Change in entropy. Consider  $R = 0.287 \text{ kJ/kg K}$  and  $\gamma = 1.4$ .
  
- 4.a) What is the difference between triple point and critical point temperature?
- 4.b) Write the importance of Mollier chart.
- 4.c) A sample of steam at 6 bar pressure is stated to have an enthalpy of 2400 kJ/kg, Make calculations for the specific volume, internal energy, and entropy for this sample of steam.
  
- 5.a) Write the importance of compressibility chart.
- 5.b) Explain the equation of state.
- 5.c) Discuss the terms in Vander waals equation and what is the importance of Vander Waals equation.
  
- 6.a) Write the importance of volumetric and gravimetric analysis for mixture of gases.
- 6.b) A sling psychrometer reads 40 °C DBT and 28 °C WBT. Calculate:
  - i) Specific humidity
  - ii) Relative humidity
  - iii) Vapor density of air
  - iv) Dew point temperature
  - v) Enthalpy of moist air.

- 7.a) Derive the expression for the air standard efficiency of Otto cycle.
- b) A diesel engine is working on Diesel cycle has a compression ratio of 15 and fuel supply is cut off at 8% of stroke. If the engine has a relative efficiency of 55%, determine the fuel consumption per kW-hr. Take the calorific value of fuel as 44,500 kJ/kg. Draw the cycle on P-V and T-S planes.
- 8.a) Explain the working of Vapor compression refrigeration cycle and mention various processes on P-h plane.
- b) Derive the expression for the efficiency of Brayton cycle.

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