M18002036

Registration No: | | | | | | | | | | |

Total Number of Pages : 02 **M.TECH**

M.TECH 2ND SEMESTER REGULAR EXAMINATIONS, MAY 2018
ADVANCED ENGG THERMODYNAMICS
Branch: TE, Subject Code:MTEPC2010
Time: 3 Hours
Max Marks : 70

PART-A (10 X 2=20 MARKS)

1. Answer the following questions.

a) Define volume expansivety and isothermal compressibility. (CO1)
b) What is claypeyron equation and explain its significance in thermodynamics ? (CO2)
c) Difference between exergy and energy. (CO1)
d) Explain the concept of Helm Holtz free energy. (CO2)
e) What are the Maxwell equation and explain their importance in establishing. relationship between thermodynamic property. (CO1)
f) Define adiabatic flame temperature. (CO3)
g) What do you mean by fugacity ? (CO3)
h) What do you mean by equipartition of energy? (CO1)
i) Why boiling point of fluid increases as increase of pressure? (CO4)
j) Explain the concept of principle of increase in entropy. (CO4)

PART-B (5 X 10=50 MARKS)

Answer any five questions from the following.

2 a) A pressure vessel has a volume of 1 m^3 and contains air at 1.6 Mpa and 195^0C.The air is cooled to 25^0C by heat transfer to the surrounding at 25^0C. Calculate the availability in the initial and final state and irreversibility of the process. Take P_0 = 100 Kpa. (CO4) [5]

b) Air at 300 Kpa and 200^0C is in a piston cylinder arrangement with a volume of 0.1 m^3. It is now compressed in polytropic process with exponent n = 1.2 to a final temperature of 300^0C. Calculate the heat transfer for the process. (CO4) [5]

3 a) From T – ds equation derive $C_p - C_v = tV\beta^2/K$. (CO1) [5]

b) Give the expression for first and second T – ds equation. (CO1) [5]

4) a) Show that for an inversion curve $(\delta z/\delta p)_T = 0$ (CO1) [5]

b) The exhaust from a gas turbine are used to heat water in a adiabatic counter flow heat exchanger. The exhaust gas is cooled from 260^0C to 120^0C, while water enters at 65^0C. The flow rate of gas and water are 1.09 and 4.186 respectively. Calculate the rate of exergy loss due to heat transfer. Assume ambient temperature is 35^0C. (CO4) [5]

5) a) Derive the equation $(\delta C_p/\delta p)_T = -T(\delta^2 V/\delta T^2)$ (CO3) [5]

b) Briefly explain Fermi Dirac and Bose Einstein statics (CO2) [5]

6) a) If the thermodynamic variables are P, V, T then prove that

$$(\delta P/\delta V)_T \ (\delta V/\delta T)_P \ (\delta T/\delta P)_v = -1$$ (CO3) [5]

b) What is Gibbs phase rule for non reactive system? Explain about degree of freedom. (CO 2) [5]

7) a) Write down about Maxwell Boltzmann distribution for different kind of molecular speed. (CO 2) [5]

b) Derive the Clausius Clapeyron equation (CO3) [5]

8) Write down the short note on [5 X 2]

a) Joules Thomson coefficient (CO1)

b) Nernst Law (CO3)

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