Question Paper Code: 54902

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2021

Fourth Semester

Chemical Engineering

19UCH402 CHEMICAL ENGINEERING THERMODYNAMICS

(Regulation 2019)

Duration: 1:45 hours Maximum: 50 Marks

PART – A (10 X 2 =20 Marks)
ANSWER ANY TEN QUESTIONS

1.	Should the automobile radiator be analyzed as a closed system or as an open system? Explain	**AN**	**CO3**
2.	Apply the First law of thermodynamics for Flow process and Non flow process.	**AP**	**CO2**
3.	Write down the equation for first law for a steady flow process	**R**	**CO1**
4.	Define phase Equilibria	**R**	**CO1**
5.	Define Duhem's theorem	**R**	**CO1**
6.	Apply the positive Deviations from I dealing.	**AP**	**CO2**
7.	State Henrys law	**U**	**CO1**
8.	State Raoults law.	**U**	**CO1**
9.	State Excess Gibbs Free energy.	**R**	**CO1**
10.	Write UNIFAC equation.	**U**	**CO1**
11.	Evaluate Van laar Constants.	**E**	**CO4**
12.	Plot the graph to find Data at mid point.	**AP**	**CO2**
13.	State Lechaetliers principle.	**R**	**CO1**
14.	Calculate the equilibrium constant at 298K of reaction $N_2O_4 \rightarrow 2NO_2$ Given that standard free energy of formation at 298K are 97,540J/mol for N_2O_4 and 51,310 J/mol for NO_2	**AP**	**CO2**

15.	Write the equation for effect of pressure on equilibrium constant.	**AP**	**CO2**

PART - B (10 X 3 =30 Marks)

ANSWER ANY THREE QUESTIONS

1	Heat is transferred to 50kg of air which is initially at 400kPa and 300K until its temperature reaches 700K. Determine the change in Internal energy, the change in enthalpy, the heat supplied, and work done in following process. a) Constant volume process. b) Constant pressure process.	**AN**	**CO3**
2	Examine the compressibility factor and molar volume for methanol vapor at 500K and 10 bar by using the following equation. Experimental values of viral coefficients are,$B=-2.19*10^{-4}m^3/mol$; $C= -1.73*10^{-8}m^3/mol$. The critical temperature and pressure of methanol are 512.6 K and 81 bar.	**AN**	**CO3**
3	At 300K and 1 bar ,the volumetric data for liquid mixture of benzene and cyclohexane are represented by $V=109.4*10^{-6} – 16.8*10^{-6}x – 2.64*10^{-6}x^2$, where x is the mole fraction of benzene and V has the units of m^3/mol. Find expressions for partial molar volumes of benzene and cyclohexane.	**AN**	**CO3**
4	The azeotrope of the ethanol – benzene system has a composition of 44.8%(mol) ethanol with a boiling point of 341.4 k at 101.3 kpa. At this temp, thevap. Pr. Of benzene is 68.9 kPa and the vapor pressure of ethanol is 67.4 kPa. Evaluate the activity co-efficient in a solution containing 10% alcohol?	**E**	**CO4**
5	Prove $\Delta G^0= -RT \ln K$	**AN**	**CO3**