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Question Paper Code: 94902

B.E./B.Tech. DEGREE EXAMINATION, NOV 2022

		Four	th Semester						
		Chemic	cal Engineering						
	190	JCH402 – Chemical	Engineering The	rmodynamics					
		(Regu	ılations 2019)						
Dura	Ouration: Three hours Maximum: 10								
		PART A - ($10 \times 1 = 10 \text{ Mark}$	s)					
1.		formance of a refrig he temperature insid		late the heat rejected to 0°C	CO1- R				
	(a) 11	(b) 22	(c) 31	(d) 44					
2.		f Cp/Cv for gas if the erature and the proc		gas is proportional to process?	CO1- R				
	(a) 2	(b) 3/2	(c)1		(d) 4				
3.	The greater the tem	perature, the is	the vapour pressi	ure.	CO2- U				
	(a) lower	her							
	(c) depends on the s	ne of the mentioned							
4.	Which of the follow	ving statement is true	e?		CO2- R				
	(a) saturation temperature is a function of pressure								
	(b) saturation pressure is a function of temperature								
	(c) both of the mentioned								
	(d) none of the mentioned								
5.	On a Z-p compressibility factor chart as p approaches zero, at the Boyle temperature the slope of the isotherm is								
	(a) zero	(b) negative	(c) positive	(d) unity					
6.	According to the eq	uation of state, the I	Boyle temperature	is	CO1- U				
	(a) 2.56*Tc	(b)2.50*Tc	(c)2.52*Tc	(d) 2.54*Tc					

7.	The relative stability of a system for transformations that occur at constant temperature and pressure is determined by its							CO4- R		
	(a) Energy (b) Helmholtz free energy (c) Entropy (d)						(d) (Gibbs free energy		
8.	What happens to the entropy in a system with constant volume and cons internal energy during a spontaneous process?								tant	CO4- R
	(a) c	(a) decreases			(b) increases					
	(c)F	(c)First decreases then increases			(d) remains same					
9.		Find the pH of a solution when 0.01 M HCl and 0.1 M NaOH are mixed in equal volumes								CO5- R
	(a) 12.65 (b) 1.04 (c) 7.0							((d) 2.0	
10.	Fino	d the conju	igate a	eid of NH ₂						CO5- R
	(a) 1	NH_3		(b) NH ₄ OH		(c) NH_4^+		(d)) NH ₂ ⁻	
				PART	$\Gamma - B$ (5	x 2= 10 Marks)			
11.	Stat	e the Thire	d law o	f thermodyna	mics.					CO1-R
12.	Exp	lain UNIC	UAC							CO2- R
13.	Def	ine activit	y coeff	icient						CO3-R
14.	List	List out various types of azeotropes.								CO4- R
15.	Write the mass balance for flow process							CO1- U		
				PART	C - (5 x	x 16 = 80 Mark	s)			
16.	(a)	-		changes in re		e processes			CO1 -U	(16)
	(b)	Write the	e vario	is statements (of secon	nd law of thern	nodynam	ics	CO1 -U	(16)
17.	(a)	Sketch th	ne PV o	liagram and P	T diagra Or	am for the beha	vior of fl	uids	CO2 -U	(16)
	(b) Choose the appropriate procedure to prove the Maxwell Equation CO2 with the help of mnemonic diagram.						CO2 -U	(16)		
18.	(a) Explain about Carnot Cycle with neat diagram. Or						CO3- U	(16)		
	(b)	Explain diagram		Thermodynar	nic Tei	mperature cycl	le with	neat	CO3- U	(16)

19. (a) The azeotrope of the ethanol – benzene system has a composition CO4 -U of 44.8% (mol) ethanol with a boiling point of 341.4 k at 101.3 kpa. At this temp, the vapour Pressure of benzene is 68.9 kPa and the vapor pressure of ethanol is 67.4 kPa. Evaluate the activity coefficient in a solution containing 10% alcohol?

Or

- (b) Construct P-x-y diagram for Cyclohexane-benzene system at CO4 -Ana (16) 313K given that at 313K the vapor pressure are P1s= 24.2 kPa and P2s= 24.42kPa. The liquid phase activity coefficient are given by $\ln \gamma_1 = 0.458 \text{ x}_2^2$ and $\ln \gamma_2 = 0.458 \text{ x}_1^2$
- 20. (a) Using Redlich-Kwong equation calculate the pressure of 0.5kg CO5- U gaseous NH3 contained in a vessel of 0.03m³ at constant T of 338K. Tc and Pc are 405.5K and 112.8 bar.

Or

(b) Derive the relationship between the equilibrium constant and CO5-U standard free energy change (16)