Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Somester Examination July 2020

End Semester Examination, July 2020

Course: Mass Transfer-II Program: B.Tech (CE+RP) Course Code: CHCE 3005

Semester: VI Time 03 hrs. Max. Marks: 100

			assumption	S				
				1 4.4	. 111	1 (
10:00 AM; the answers must be subr	nitted by 09:	59:59 AM	I next day.					
(iv) No submission of Answer-sheet shall be entertained after 24 Hrs.								
the bottom (right hand side bottom corner) of each page								
SECTION A	A (5X20=1	00) (Atter	npt all ques	stions)			Mark	СО
2							S	CO
1500 m ³ /h of a gas mixture containing 20 mole% solute and rest inert enters the absorber at 250								
K temperature &106.6 kPa press	ire to remo	ve 80% o	of original s	solute. Solu	ute free w	vater used		
for absorption contains 10 mole%	solute whe	en it leav	es the towe	r at the bo	ttom. Cal	culate the	20 M	CO2
solvent flow rate to tower.								
An aqueous solution containing v	aluable solu	ite is colo	oured by sm	all amount	s of an ir	npurity. It		
1 0			•					
are as follows:			-			-		
Kg carbon/kg solution 0	0.001	0.004	0.008	0.02	0.04]		
Equilibrium colour 9.6	8.6	6.3	4.3	1.7	0.7		20 M	CO3
The original solution has a colour	concentrat	ion of 9.0	6 measured	on an arbi	trary scal	e and it is		
desired to reduce the colour to 15% of its original value. Determine the quantity of fresh carbon								
required per 2XY kg of solution for	or a two stag	ge counte	rcurrent ads	sorption. W	here XY	is the last		
two digits of student SAP ID.								
A wet solid is dried from 40% to	10% moist	ure under	constant dr	ying condi	tions in :	5 hours. If		
the equilibrium moisture content is 0.0416 kg moisture/kg dry solid and the critical moist						moisture		
content is 14%, how long will it ta	ke to dry fro	om 40% t	o 5% moisti	ıre under tł	ne same c	onditions.	20 M	CO4
All percentages other than equilibrium	ium moistu	ire conter	nt are on we	t basis. Ass	ume line	ar relation		
between rate of drying and moistu	re content	during fai	lling rate pe	riod.				
	(i) Read the instruction carefully before (ii) This question paper has total five of a question together. (iii) Answer sheet to be submitted we 10:00 AM; the answers must be submit (iv) No submission of Answer-sheet is (v) The Answers should be attempted programme, semester, course name, or the bottom (right hand side bottom constrained by a section of the bottom (right hand side bottom constained by a solution containing variations in the bottom section of the decolourised by adsorption obtained by stirring various amount are as follows: Kg carbon/kg solution 0 Equilibrium colour 9.6 The original solution has a colour desired to reduce the colour to 159 required per 2XY kg of solution for two digits of student SAP ID. A wet solid is dried from 40% to the equilibrium moisture content content is 14%, how long will it tal. All percentages other than equilibrium is to be solve the colour form the solution for the equilibrium moisture content content is 14%, how long will it tal.	(i) Read the instruction carefully before attemptif (ii) This question paper has total five questions. A of a question together. (iii) Answer sheet to be submitted within 24 hrs 10:00 AM; the answers must be submitted by 09: (iv) No submission of Answer-sheet shall be enter (v) The Answers should be attempted in blank programme, semester, course name, course code, the bottom (right hand side bottom corner) of each SECTION A (5X20=10) 1500 m ³ /h of a gas mixture containing 20 mo K temperature &106.6 kPa pressure to remond for absorption contains 10 mole% solute when solvent flow rate to tower. An aqueous solution containing valuable soluties to be decolourised by adsorption of an impu- obtained by stirring various amounts of adsorption are as follows: Kg carbon/kg solution 0 0.001 Equilibrium colour 9.6 8.6 The original solution has a colour concentratt desired to reduce the colour to 15% of its origon required per 2XY kg of solution for a two stagents two digits of student SAP ID. A wet solid is dried from 40% to 10% moister the equilibrium moisture content is 0.0416 Hereit content is 14%, how long will it take to dry from All percentages other than equilibrium moisture	(i) Read the instruction carefully before attempting.(ii) This question paper has total five questions. 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Determin required per 2XY kg of solution for a two stage countercurrent ads two digits of student SAP ID.A wet solid is dried from 40% to 10% moisture under constant dr the equilibrium moisture content is 0.0416 kg moisture/kg dry s content is 14%, how long will it take to dry from 40% to 5% moisture All percentages other than equilibrium moisture content are on were	(ii) This question paper has total five questions. All questions are compulsory. Atte of a question together.(iii) Answer sheet to be submitted within 24 hrs from the scheduled time as the of 10:00 AM; the answers must be submitted by 09:59:59 AM next day. (iv) No submission of Answer-sheet shall be entertained after 24 Hrs. 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Determine the quan required per 2XY kg of solution for a two stage countercurrent adsorption. W two digits of student SAP ID.A wet solid is dried from 40% to 10% moisture under constant drying condit the equilibrium moisture content is 0.0416 kg moisture/kg dry solid and the content is 14%, how long will it take to dry from 40% to 5% moisture under the	(i) Read the instruction carefully before attempting. (ii) This question paper has total five questions. All questions are compulsory. Attempt all the of a question together. (iii) Answer sheet to be submitted within 24 hrs from the scheduled time as the examination (iii) Answer sheet to be submitted by 09:59:59 AM next day. (iv) No submission of Answer-sheet shall be entertained after 24 Hrs. 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Determine the quantity of free required per 2 XY kg of solution for a two stage countercurrent adsorption. Where XY two digits of student SAP ID. A wet solid is dried from 40% to 10% moisture under constant drying conditions in 5 the equilibrium moisture content is 0.0416 kg moisture (kg dry solid and the critical content is 14%, how long will it take to dry from 40% to 5% moisture under the same c All percentages other than equilibrium moisture content are on wet basis. Assume line in the same content is 14%, how long will it take to dry from 40% to 5% moisture under the same c and percentages other than equilibrium moisture content are	(i) Read the instruction carefully before attempting. (ii) This question paper has total five questions. All questions are compulsory. Attempt all the sub-parts of a question together. (iii) Answer sheet to be submitted within 24 hrs from the scheduled time as the examination starts at 10:00 AM; the answers must be submitted by 09:59:59 AM next day. 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The equilibrium data obtained by stirring various amounts of adsorbent with original solution at constant temperatures are as follows: Kg carbon/kg solution 0 0.001 0.004 0.008 0.02 0.04 Equilibrium colour 9.6 8.6 6.3 4.3 1.7 0.7 The original solution has a colour concentration of 9.6 measured on an arbitrary scale and it is desired to reduce the colour to 15% of its original value. Determine the quantity of fresh carbon required per 2XY kg of solution for a two stage countercurrent adsorption. Where XY is the last two digits of student SAP ID. A wet solid is dried from 40% to 10% moisture under constant drying conditions in 5 hour	(i) Read the instruction carefully before attempting. (ii) This question paper has total five questions. All questions are compulsory. Attempt all the sub-parts of a question together. (iii) Answer sheet to be submitted within 24 hrs from the scheduled time as the examination starts at 10:00 AM; the answers must be submitted by 09:59:59 AM next day. 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The equilibrium data obtained by stirring various amounts of adsorbent with original solution at constant temperatures are as follows: 20 M K gas following valuable solute is original value. Determine the quantity of fresh carbon required per 2XY kg of solution for a two stage countercurrent adsorption. Where XY is the last two digits of student SAP ID. 20 M A wet solid is dried from 40% to 10% moisture under constant drying conditions in 5 hours. If the equilibrium moisture content is 0.0416 kg moisture/kg dry solid an

Q 4	If 250 kg of a solution of acetic acid (C) and water (A) containing 30% acid is to be extracted	
	two times cross currently with isopropyl ether (B) at 20 °C, using 50 kg of solvent in each stage,	
	determine the quantities and compositions of the various streams. How much solvent would be	
	required if the same final raffinate concentration were to be obtained with one stage?	
		1

Equilibrium Data:

Q 5

	Water layer (100 kg)			Isopropyl ether layer (100 kg)				
	Acetic acid	Water	Isopropyl ether	Acetic acid	Water	Isopropyl ether		
	0.69	98.1	1.2	0.18	0.5	99.3		
	1.41	97.1	1.5	0.37	0.7	98.9	20 M	CO1
	2.89	95.5	1.6	0.79	0.8	98.4		
	6.42	91.7	1.9	1.93	1.0	97.1		
	13.30	84.4	2.3	4.82	1.9	93.3		
	25.50	71.1	3.4	11.40	3.9	84.7		
	36.70	58.9	4.4	21.60	6.9	71.5		
	44.30	45.1	10.6	31.10	10.8	58.1		
	46.40	37.1	16.5	36.20	15.1	48.7		
 i) Give classification of cooling towers. Explain natural draft and mechanical draft cooling tower in detail. ii) Determine the following psychrometric properties of a moist air sample having a dry bulb temperature 35 °C and a humidity of 0.025 kg/kg dry air using the psychrometric chart and the vapor pressure equation for water a) Relative humidity b) dew point The Antoine equation for water is lnPA^V =11.965-3984.9/(T-39.7). The total pressure is 1 atm. 						15+5 M	C05	