Registration Number:





MANIPAL UNIVERSITY

Vth Semester B.Tech (Chemical Engineering)

END SEMESTER EXAMINATION – NOV/DEC 2015

SUBJECT: Computational Methods for Chemical Engineers (CHE 311)

Time: 3 hrs

Max. Marks: 100

STD: 195

✤ Instructions to students

- 1. Answer any FIVE FULL questions.
- 2. Make suitable Assumption if required
- 3. Answer should be correct to three places of decimal

1	Α	A reversible reaction $2A + B \leftrightarrow C$ can be characterized by the equilibrium relationship 1								
		K	$=\frac{(C_{c,0}+X)}{(C_{a,0}-2X)^2(C_{b,0}-X)}$							
		where the nomenclature c_i represents the concentration of constituent <i>i</i> , the subscript 0								
		designates the initial concentration of each constituent and variable X represents the number								
		of moles of	of moles of C that are produced. If K=0.016, $c_{a,0}$ =42, $c_{b,0}$ =28, and $c_{c,0}$ =4, determine the							
		value of X	value of X using secant method correct to 3 decimal points.							
1	B	Determine	the temperature distribution on the surface of a 3×4 cm ² rectangular slab under	10						
		steady state	e if one end is insulated as shown in figure. Take $\Delta x = 1$ cm and $\Delta y=1$ cm							
			303 K							
		293	280							
		INSULATED								
2	•	The normal	lity of loophing liquid is the most important factor in determining the diffusivity	10						
2	A	The normality of leaching liquid is the most important factor in determining the diffusivity 10								
		for the stu	ady of kinetics of elution of copper compounds from ion exchange resins.							

		Determine the diffusity (cm^2s^{-1}) when N = 2 and 3.5.														
		N		0.0521	0.1028	0.203	36	0.4946	0.986	3	1.9739	2.443	5.06			
		D*	10 ⁶	1.65	2.1	2.27		2.76	3.12		3.06	2.92	2.07	_		
2	B	B Find the quadratic factors of ' x^4 - 1.1 x^3 + 2.3 x^2 + 0.5 x + 3.3 = 0' using Bairstow method and												10		
		x ² - 1	rx - s a	as starting	g factor.	The ε_a va	alue	should be	within	5%.						
3	A	The data listed in the following table give hourly measurements of heat flux q (cal.cm ² h ⁻¹) at 10														
		the s	surfac	e of a so	lar collec	tor. Esti	imate	e the tota	l heat a	bsor	bed by a	a 150000	$) \text{ cm}^2 \text{ co}$	ollector		
		panel during a 10 h period. The panel has an absorbance efficiency e_{ab} of 45%. The total														
		heat absorbed is given by														
		\int_{t}^{t}														
		$H = e_{ab} \int_0 qAdt$														
		t	0	1	2	3	4	5	6 7		8	9	10			
		q	0.1	1.62	5.32	6.29	7.8	8.81	8 8.	57	8.03	7.04	6.27	-		
3	-					1										
	В	It is	know	n that the	e tensile	treated. The following data is collected:										
C	В	It is treat	know ed. Tł	n that the	e tensile ing data	strength is collec	of a ted:	plastic in	creases	s as a	1 functio	n of the	time it i	is heat-	10	
	В	It is treat	know ed. Th	n that the follow $\frac{1}{2}$	ing data	is collec	of a ted: 20	plastic ir		as a	$\frac{1}{0}$	n of the 60	time it i	is heat-	10	
	в	It is treat Tin Ter	know red. Tł ne(mir nsile	n that the ne follow	ing data	strength is collec 15 20	of a ted: 20	plastic ir 25 50	40 33	5 as a 4	$\frac{1}{0} \qquad 55$	n of the 60 60 60	time it 1 75 78	is heat-	10	
	В	It is treat Tin Ten stree	know ed. Th ne(min nsile ength()	n that the ne follow n) Pa)	ing data 10 4	is collec 15 20	of a ted: 20 18	$\begin{array}{c c} plastic in \\ \hline 0 & 25 \\ \hline 5 & 50 \\ \hline \end{array}$	40 33	5 as a	0 55 8 80	n of the 6 60 0 60	time it i 75 78	is heat-	10	
	В	It is treat Tin Ten stre	know red. Th ne(min nsile ength(n that the ne follow n) Pa)	ing data 10 4	is collec 15 20	of a ted: 20 18	plastic ir 25 50 50	40 33	5 as a 4	0 55 8 80	n of the 6 60 0 60	time it i 75 78	is heat-	10	
	В	It is treat Tin Ten stree	know red. Th ne(min nsile ength(n that the ne follow n) Pa) ght line t	e tensile ing data 10 4 o this da	is collec 15 20 a and us	of a ted: 20 18	plastic ir	40 40 33 n to de	s as a a a a a a a a a a a a a a a a a	$\frac{0}{8} = \frac{55}{8}$	n of the $60 \\ 60 \\ 60 \\ 60 \\ 60 \\ 60 \\ 60 \\ 60 $	time it i	is heat-	10	
	в	It is treat Tin Ten stree Fit a minu	know ed. Th ne(min nsile ength(a straig utes of	n that the ne follow n) Pa) ght line to f heat treat	e tensile ing data 10 4 o this data	is collec 15 20 ta and us	of a ted: 20 18 se the	plastic ir	40 33 n to de	s as a	$\frac{0}{558} = \frac{55}{8}$	n of the 6 60 0 60 ensile st	time it i	is heat-	10	
	Δ	It is treat Tin Ten stree Fit a minu	know ed. Th ne(min nsile ength(a straig utes of	n that the ne follow n) Pa) ght line t f heat trea	a tensile ing data 10 4 o this da atment	is collec 15 20 ta and us ence of l	of a ted: 20 18 se the	plastic in 25 50 e equatio	40 33 n to de	s as a a a a a a a a a a a a a a a a a	0 55 8 80	n of the 6 60 0 60 ensile st	time it i 75 78 rength a	is heat-	10	
4	A	It is treat Tin Ten stree Fit a minu Writ	know red. Th ne(min nsile ength(a straig utes of te a no	n that the ne follow n) Pa) ght line t f heat trea ote on the	e tensile ing data 10 4 o this da atment converg	is collec 15 20 ca and us ence of l	of a ted: 20 18 se the bisec	plastic in 25 50 e equatio	40 33 n to de	termi	0 55 8 80	n of the	time it i	is heat-	10	
4	B A B	It is treat Tin Ten stree Fit a minu Writ	know ed. Th ne(min nsile ength(a straig utes of te a no cuss th	n that the ne follow n) Pa) ght line to f heat trea ote on the e classifi	e tensile ing data 10 4 o this data atment converg cation of	a and us	of a ted: 20 18 se the bisec	plastic in 25 50 e equation etion mether rential eq	40 40 33 n to dem nod uations	s as a a a a a a a a a a a a a a a a a	0 55 8 80 ine the t	n of the 6 60 0 60 ensile st	time it i	is heat-	10 5 5	
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