Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2013

Subject code: 733001 **Date: 13-05-2013**

Subject Name: Advance Process Optimization

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Explain following terms in context to optimization: constraints, objective function, feasible region, unimodal function, continuous function, derivative discontinuity, convex function. **07**

(b) A poster is to contain 300 cm^2 of printed matter with margins of 6 cm at the top and bottom and 4cm at each side. Find the overall dimensions that minimize the total area of the poster. **07**

Q.2 (a) A liquid phase, isothermal, reversible first order, exothermic reaction **07**

$$A \underset{k_2}{\overset{k_1}{\rightleftharpoons}} B$$

is to be carried out in a CSTR. The reactor space time is to be held constant at space time τ. The feed is pure A. Show that the choice of optimum temp which will maximize conversion of A is the one which will maximize $k_1\tau / 1 + k_2\tau$.

(b) Search for an minimum value of discreet function f(x) using following data: **07**

x	f	x	f	x	f	x	f
2	141	8.1	155	11	62	20	89
2.2	142	8.2	96	12	64	25	91
3	143	8.5	87	13	74.5	25.5	92
5	145	8.8	78	14	75	26	97
6	150	9.1	69	15	78	26,2	98
7	153	9.9	60	16	80	26.3	99
8	154	10.1	51	16.5	83	26.6	103

OR

(b) Find the minimum of $y = \frac{2}{x_1 x_2} + \frac{3}{x_2} + 4x_1 x_2^{\,2}$ using geometric programming and also find the location of minimum. **07**

Q.3 (a) A length of wire is to cut in two parts. One portion is to be bent into the form of a circle, and the other into the form of a square. In what ratio must the wire be cut if the sum of the areas enclosed by the circle and square is to the least possible? **07**

(b) Using the method of Lagrangian multipliers find the minimum of $y = 4x_1^{\,2} + 5x_2^{\,2}$ subject to $2x_1 + 3x_2 = 6$. **07**

OR

Q.3 (a) Find the value of x in the interval (0,1) which minimizes the function $f = x(x - 1.5)$ with ± 0.05 using Golden Section search technique. **07**

	(b)	Compare Two-point Equal Interval search, Dichotomous search, Golden Section search and Fibonacci search technique of Region Elimination with working equations of each.	**07**
Q.4	**(a)**	Explain the interpretations with examples for • Zero coefficient in column. • No positive ratio. • Identical values of smallest positive ratio. while solving any linear programming problem using simplex method.	**07**
	(b)	Minimize given multivariable function, using single variable technique. $f(x) = x_1^4 - 2x_1^2 x_2 + x_2^2 + x_1^2 - 2x_1 + 5$	**07**
		OR	
Q.4	**(a)**	Explain the basics of population based search techniques, List out different steps in GA and discuss role of fitness selection and survival selection.	**07**
	(b)	Explain the basics of Multi Objective Optimization (MOO) and discuss chemical engineering applications.	**07**
Q.5	**(a)**	Discuss role of Quadratic programming and successive quadratic programming for optimization in chemical engineering with examples.	**07**
	(b)	Giving the examples of Integer and mixed integer programming, list out methods to solve them discussing strength and weakness.	**07**
		OR	
Q.5	**(a)**	Explain the concept and algorithm of Simulated Annealing technique with example.	**07**
	(b)	Explain TABU search optimization technique with algorithm and example.	**07**

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