Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY ME- SEMESTER II– EXAMINATION – SUMMER 2015

Subje	ubject Code: 2721602Date: 26/05/Subject Name: Chemical Process OptimizationTotal MarksSime: 2:30 PM - 5:00 PMTotal MarksDistructions:Total Marks		
Subj Time: Instruc			
	1. A 2. M 3. Fi	ttempt all questions. [ake suitable assumptions wherever necessary. [gures to the right indicate full marks.	
Q.1	(a)	Write necessary any sufficient conditions for an extreme value of multivariable objective function and find out stationary point for $y = 8x_1 + x_2 + 5x_1^2 - 9x_1x_2 + 2x_2^2$	07
	(b)	Find the specification of an closed-topped rectangular tank whose total area is to be 144 m^2 , if a maximum volume is required. Use any method capable to solve this type of problem.	07
Q.2	(a)	We have to locate the maximum of the function $y = 100 - (10 - x_1)^2 - (5 - x_2)^2$ within 1 % accuracy. Using Simplex method (Pattern Search) setup the procedure to solve the problem.	09
	(b)	List out multivariable analytical methods for optimization problems with restricted variables-equality constraints and explain any one of them with example.	05
		OR	
	(b)	Find the volume of the largest right circular cylinder that can be inscribed inside a sphere of radius R.	05
Q.3	(a)	Explain the role of Crossover and Mutation in Genetic Algorithm.	07
	(b)	Find the minimum of the objective function $y = x_1^2 + 3x_2^2 + 5x_3^2$ starting from the point {1,6,-7} and using the Powell method. Analytical methods may be used to locate the one-dimensional optima.	07
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Q.3	(a)	Explain the basics of Multi objective optimization (MOO). Classify the methods for MOO and discuss chemical engineering applications.	07
	(b)	Minimize Rosenbrock function $f(x) = 100(x_2 - x_1^2)^2 + (1 - x_1^2)$ with an initial point of (-1.2, 1.0) using steepest decent method up to two iterations.	07
Q.4	(a)	Explain the working of Differential Evolution for optimization.	06
	(b)	Define a suitable search region and a feasible initial base point for the complex method of search in minimizing $y = 4x_1 + x_2 + 2x_3$ subject to the restrictions that $x_i \ge 0$ and	08

$$x_1 + x_2 + x_3 \le 6$$

$$5x_1 - x_2 + x_3 \le 4$$

$$x_1 + 3x_2 + 2x_3 \ge 1$$

Setup a complex method of search and carryout two cycles of search.

- Q.4 (a) Explain the working of Simulated Annealing for optimization.
 - (b) Find the global minimum and maximum of the function $y = x_2 x_1^2$ if it is **08** subject to the restriction that $1 x_1^2 x_2^2 = 0$ using the penalty function method.
- Q.5 (a)Explain TABU search optimization technique with algorithm and example.07(b)Write basic SQP algorithm and illustrate it using the following example.07Minimize x_2 subjectto $-x_2 + 2x_1^2 x_1^3 \le 0$ and

 $-x_2 + 2(1-x_1^2) - (1-x_1^3) \le 0.$

OR

Q.5 (a) Explain Bacterial Foraging Optimization Algorithm.
 (b) Explain Particle Swam Optimization technique with algorithm. Explain it with simple example to demonstrate working of algorithm.

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