Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 1724003 **Date: 03-06-2013**

Subject Name: Optimization in Rubber Industries

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)** Write necessary any sufficient conditions for an extreme value of multivariable objective function **06**

(b) An open top box is to be made out of a piece of cardboard measuring 40cm X 30cm by cutting off equal surfaces from the corners and turning up the side. Fin height of the box for maximum volume. **08**

Q.2 **(a)** For the objective to minimize the investment cost given fixed product demand discuss model for flow shop plants - single product campaigns. **08**

(b) Discuss cycle time for design and scheduling of batch plant. **06**

OR

(b) Discuss with example óHow parallel units and intermediate storage reduce cycle time for batch plan?ô **06**

Q.3 **(a)** List out limitations of Region Elimination methods. Compare performance of different Region Elimination methods for Initial interval of 3.5 for accuracy of 0.1. **07**

(b) Using the method of the penalty function find the minimum of **07**

$y = 4x_1^2 + 5x_2^2$ subject to $2x_1 + 3x_2 = 6$.

OR

Q.3 **(a)** Find the value of x in the interval (0,1) which minimizes the function $f = x^2(x-1.5)^2$ with ± 0.05. **07**

(b) Find the global minimum and maximum of the function $y = x_2 - x_1^2$ if it is subject to the restriction that $1 - x_1^2 - x_2^2 = 0$ using Lagrangian multipliers method. **07**

Q.4 **(a)** Minimize Rosenbrock function $f(x) = 25(x_2 - x_1^2)^2 + (1 - x_1^2)$ with an initial point of (5, 2) using Hooke-Jeeves method. **07**

(b) For minimizing $y = 4x_1 + x_2 + 2x_3$ subject to the restrictions that $x_i \geq 0$ and **07**

$$x_1 + x_2 + x_3 \leq 6$$
$$5x_1 - x_2 + x_3 \leq 4$$
$$x_1 + 3x_2 + 2x_3 \geq 1$$

Setup only initial complex for a Box complex method of search.

OR

Q.4 **(a)** Find the maximum of **08**

$$y = 10x_1^2 - 4x_1x_2 + 3x_2^2 + 5x_2x_3$$

subject to

$$x_1 + 2x_2 \leq 3$$
$$x_2 - x_3 \geq 2$$
$$x_1 \geq 1$$

(b) Explain the role of selection operators and their importance in Genetic Algorithm for optimization. **06**

Q.5 **(a)** 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. **08**

(b) Explain the role of crossover and mutation in Genetic Algorithm for optimization. **06**

OR

Q.5 **(a)** Find the maximum of the function **08**

$$y = 6x_1 + 5x_2$$

Subject to the restrictions

$$-2x_1 - 5x_2 \le -20$$

$$5x_1 + x_2 \le 5$$

$$3x_1 + 11x_2 \le 33$$

with $x_1 \ge 0$ and $x_2 \ge 0$

(b) Discuss optimization of single variable problems with discreet variable. **05**

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