Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2724003 **Date: 24/05/2016**

Subject Name: Optimization in Rubber Industries

Time:10:30 am to 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 with example: feasible region, multimodal function, derivative discontinuity, discreet variable. **08**

(b) We want to apply the region elimination search techniques to reduce the interval of uncertainty for maximum value of the function $f(x) = 6.44 + 1.2x - x^2$ from [0,1] to less than 2 percent of its original size. Compare all region elimination methods for above case. **06**

Q.2 **(a)** Discuss Necessary and sufficient conditions for an extremum of an unconstrained single variable function. **07**

(b) Explain the concept and working of Genetic Algorithm for optimization **07**

OR

(b) 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**

Q.3 **(a)** Search for an minimum value of discreet function f(x) using following data: **07**

x	f	x	f	x	f	x	
2	141	8.1	155	11	62	20	8
2.2	142	8.2	96	12	64	25	9
3	143	8.5	87	13	74.5	25.5	9
5	145	8.8	78	14	75	26	9
6	150	9.1	69	15	78	26,2	9
7	153	9.9	60	16	80	26.3	9
8	154	10.1	51	16.5	83	26.6	1

(b) Explain the method of Successive Quadratic Estimation to minimize $f(x) = 2x^2 + \frac{16}{x}$. **07**

OR

Q.3 **(a)** Explain the Khachiyanôs method for solving Linear Programming. **07**

(b) Explain the basics of Multi objective optimization (MOO). Discuss applications of MOO. **07**

Q.4 **(a)** Using the Rosenbrock search technique, seek the minimum of the objective function $y = 6x_1^2 + x_2^2$ using $s_1 = s_2 = 1$, $\beta = 1/2$ and $\alpha = 3$. Carry out two iterations. **07**

(b) Explain Karmakarôs Algorithm for solving Liner Programming **07**

OR

Q.4 Define a suitable search region and a feasible initial base point for the complex method of search in minimizing $y = 5x_1^3 - 3x_1^2 x_2 + x_2^2$ subject to the restrictions that **14**

$$3 + 2x_1 - 3x_2 \le 0$$

$$(x_1 - 1)^2 + (x_2 - 2)^2 \le 4$$

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

Q.5 **(a)** Find the minimum of the objective function using sequential simplex method. **07**

$$y = x_1^2 + x_2^2 + 4x_3^2 + x_4^2$$

Carry out four cycles of vertex rejection and regeneration.

(b) Find the location and determine the nature of the stationary values of the unrestricted function $y = x^4 - 8x^3 + 24x^2 - 32x + 16$ **07**

OR

Q.5 **(a)** List out different steps in GA and discuss role of fitness selection and survival selection. **07**

(b) Explain successive quadratic programming for multi variable optimization with example. **07**

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