Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER – I EXAMINATION – SUMMER 2017

Subject Code: 2710310 **Date:08/05/2017**

Subject Name: Optimization Techniques for Engineers

Time: 02:30 p.m. to 05:00 p.m. **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 algorithm for interval halving method. **06**

(b) Minimize the following function using exhaustive search method (up to only two iteration). **08**

$$f(x) = x^2 + \frac{54}{x}$$

Q.2 **(a)** Explain algorithm for Hooke-Jeeves search method. **07**

(b) Apply steepest descent method to the following function starting from (0,0). **07**

$$f(x, y) = 2x^2 - 2xy + y^2 + 2x - 2y$$

OR

(b) Minimize the following function using successive quadratic estimation method (up to only two iteration). **07**

$$f(x) = x^2 + \frac{54}{x}$$

Q.3 **(a)** Give explanation on Variational approach to solve optimal control problem. **06**

(b) Minimize: $f(x) = (x_1^2 + x_2 - 11)^2 + (x_2^2 + x_1 - 7)^2$ **08**

Subject to: $g_1(x) = 26 - (x_1 - 5)^2 - x_2^2 \geq 0$,

$g_2(x) = 20 - 4x_1 - x_2 \geq 0$,

$x_1, x_2 \geq 0$.

Using Generalized Reduced Gradient Method from the initial point $x_1^{(0)} = 1$ and $x_2^{(0)} = 2$. Assume suitable data necessary to solve the problem (up to only one iteration).

OR

Q.3 **(a)** Explain algorithm for Fibonacci search method. **06**

(b) Minimize: $f(x) = (x_1^2 + x_2 - 11)^2 + (x_2^2 + x_1 - 7)^2$ **08**

Subject to: $g_1(x) = 26 - (x_1 - 5)^2 - x_2^2 \geq 0$,

$g_2(x) = 20 - 4x_1 - x_2 \geq 0$,

$x_1, x_2 \geq 0$.

Using Gradient Projection Method from the initial point $x_1^{(0)} = 1$ and $x_2^{(0)} = 2$. Assume suitable data necessary to solve the problem (up to only one iteration).

Q.4 **(a)** Solve the problem using simplex method: **07**

$$\text{Maximize } z = 2x_1 - 3x_2 + 4x_3$$

$$\text{Subject to } 4x_1 - 3x_2 + x_3 \le 3,$$

$$x_1 + x_2 + x_3 \le 10,$$

$$2x_1 + x_2 - x_3 \le 10,$$

$$x_1, x_2, x_3 \ge 0.$$

(b) Apply Golden Section Search Method to obtain interval after 10 function evaluations for the minimization of the function $f(x) = x^2 - 10e^{0.1x}$ in the interval $(-10, 5)$. **07**

OR

Q.4 **(a)** Solve the problem using simplex method: **07**

$$\text{Maximize } p = 5x + 4y + 3z$$

$$\text{Subject to } x + y + z \le 30,$$

$$2x + y + 3z \le 60,$$

$$3x + 2y + 4z \le 84,$$

$$x, y, z \ge 0.$$

(b) A boat company makes three different kinds of boats. All can be made profitable in this company, but the company's monthly production is constrained by the limited amount of labour, wood and screws available each month. The director will choose the combination of boats that maximizes his revenue in view of the information given in the following table: **07**

Input	Row Boat	Canoe	Keyak	Monthly Available
Labour (Hours)	12	7	9	1260 hours
Wood(Board feet)	22	19	16	19008 board feet
Screws(Kg)	2	4	3	396 Kg
Selling price (In Rs.)	4000	2000	5000	

Formulate the above as LPP and solve it by simplex method.

Q.5 **(a)** Draw a flowchart of the optimal design procedure and give brief explanation **07**

(b) Explain the optimality criteria for multivariable optimization algorithms. **07**

OR

Q.5 **(a)** Explain the genetic algorithm. **07**

(b) Explain the difference between genetic algorithm and traditional Methods. **07**

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