

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 3154201

Date: 23/06/2023

Subject Name: Optimization Techniques

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	Marks
Q.1 (a) Explain any six applications of optimization in engineering.	03
(b) Explain different types of constraints in Engineering Optimization with suitable examples.	04
(c) Explain the concept of maxima and minima in single variable optimization.	07
Q.2 (a) Explain the following terms: 1) Design vectors 2) Design constraints 3) Constraint surface.	03
(b) Give the detail classification of optimization problems.	04
(c) Write standard form of a Linear programming and explain with example how non-standard forms can be converted to standard form.	07
OR	
(c) Using Simplex Method, Maximize $f(X) = 5x_1 + 10x_2$, Subjected to $x_1 + 2x_2 \leq 100$, $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$ and, $x_1 \geq 0$, $x_2 \geq 0$.	07
Q.3 (a) Define saddle point and indicate its significance.	03
(b) State the necessary and sufficient condition for the maximum of multivariable function $F(X)$.	04
(c) Explain Dichotomous search method with suitable example.	07
OR	
Q.3 (a) Differentiate Linear and Non Linear programming.	03
(b) Explain Fibonacci search method.	04
(c) Using Hessian Matrix, find the maximum value of the function $F(x_1, x_2) = 26x_1 + 20x_2 + 4(x_1 \cdot x_2) - 3(x_1^2) - 4(x_2^2)$.	07
Q.4 (a) Explain direct root method.	03
(b) Differentiate Fibonacci method and Golden Section method.	04
(c) Use the golden section search to find the value of X that minimizes $F(X) = (X)^4 - 14(X)^3 + 60(X)^2 - 70X$ in the range $[0, 2]$. Locate this value of X to within a range of 0.3	07
OR	
Q.4 (a) Differentiate Direct and Indirect Search methods.	03
(b) Describe the Random Search Method for constrained optimization problem.	04
(c) Explain the Algorithm and Flowchart for Powell's Method of optimization.	07

- Q.5** (a) Explain the following terms: 1) Objective function 2) Bound feasible point 3) Infeasible point. **03**
- (b) Explain the operations of Crossover in Genetics Algorithm. **04**
- (c) Minimize $f(X_1, X_2) = X_1 - X_2 + 2(X_1 * X_1) + 2(X_1 * X_2) + (X_2 * X_2)$ by taking the starting point as $X_1 = [0, 0]$ using Newton's method. **07**
- OR**
- Q.5** (a) Explain the strength and weakness of Optimization in Engineering. **03**
- (b) Explain the features of simulated annealing method. **04**
- (c) Explain Fuzzy optimization techniques in detail with suitable example. **07**
