

C U SHAH UNIVERSITY

WADHWAN CITY

Branch: Mechanical

Semester: II

Subject Code:5TE02AOT1

Subject Name: Advanced Optimization Techniques

SECTION-I

- Q.1**
- (a) Show graphically that minimum of $f(x)$ is same as maximum of $-f(x)$. **02**
 - (b) Give at least three specific applications of optimization in mechanical engineering. **01**
 - (c) What is meant by 'pre -assigned parameters'? Explain with example. **02**
 - (d) Define ' objective function' with example. How is it written in standard format? **02**
- Q.2**
- (a) A practical design problem usually will not be unconstrained one still the study of unconstrained problems is important. Justify. **05**
 - (b) Classify the unconstrained minimization methods. **05**
 - (c) Give flow chart of pattern search method. **04**

OR

- Q.2**
- (a) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ using pattern search method starting from the point $x_1 = \{0, 0\}$. Take $\Delta x_1 = \Delta x_2 = 0.8$ and $\epsilon = 0.1$. Show only one iteration. **05**
 - (b) State the steps of random walk method. **05**
 - (c) Explain MATLAB functions for solving optimization problems in MATLAB optimization tool box. **04**
- Q.3**
- (a) State the steps of any one gradient search method. **05**
 - (b) Write a short note on equality and inequality constraints with examples. **05**
 - (c) State the Geometric Programming Problem in standard format. **04**

OR

- Q.3**
- (a) What are Lagrange Multipliers? Explain its usefulness for solving optimization problems having equality constraints. **05**
 - (b) Explain Deterministic and Stochastic Programming problem giving appropriate example. **05**

C U SHAH UNIVERSITY

WADHWAN CITY

- (c) Briefly explain the optimization problems based on nature of design variable with example. **04**

C U SHAH UNIVERSITY

WADHWAN CITY

SECTION-II

Q.4	(a)	With the help of graphical sketch, explain : (1) bound acceptable point (2) bound unacceptable point.	02
	(b)	Briefly explain 'multi objective optimization problem' giving example.	02
	(c)	What is meant by 'constrained and unconstrained optimization'? Give examples of both.	02
	(d)	Briefly justify the need of computer in solving optimization problems.	01
Q.5	(a)	Explain 'Relative and Global minima and maxima' with help of sketches. Determine the maximum and minimum values of the function $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$.	05
	(b)	Explain exterior penalty function method of optimization.	05
	(c)	What is 'Hessian matrix'? How could it be checked for 'Positive Definite'?	04
		OR	
Q.5	(a)	Explain interior penalty function method of optimization.	05
	(b)	Stating working principle of Genetic Algorithms, explain three operators of the same.	05
	(c)	Find the dimensions of a rectangular prism type box that has largest volume when the sum of its length, width and height is limited to a maximum value of 60 inches and its length is restricted to a maximum value of 36 inches.	04
Q.6	(a)	Describe in brief different kinds of minimization methods of one dimensional and explain interpolation method in brief.	05
	(b)	Formulate an optimization problem for helical compression spring to minimize weight. Assume suitable data of required.	05
	(c)	Formulate an optimization problem for a gear pairs to minimize weight. Assume suitable data of required.	04
		OR	
Q.6	(a)	State how an optimization problem can be formulated for optimum design of shaft?	05
	(b)	If a column is to be optimized how can it be formulated? Explain with related equations.	05
	(c)	If a torsion bar is to be optimized, what considerations will be made? How? Explain with related equations and sketch.	04

C U SHAH UNIVERSITY
WADHWAN CITY