

GUJARAT TECHNOLOGICAL UNIVERSITY**ME – SEMESTER – I(New)- EXAMINATION – SUMMER-2020****Subject Code: 3710310****Date: 02-11-2020****Subject Name: Optimization Techniques for Engineers****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 14

$$\text{Maximize } Z = 4x_1 + x_2$$

$$\text{subject to ,}$$

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 4$$

$$x_1, x_2 \geq 0$$
 to get optimal solutions.
- Q.2 A Consider the function $f(x) = x^4 - 14x^3 + 60x^2 - 70x$, Use the Exhaustive search method to find the value of x that minimizes $f(x)$ over the range $[0,5]$. 07
 B Use the bisection search to find the value of x that minimizes $f(x) = x^4 - 14x^3 + 60x^2 - 70x$, in the range $[0,5]$. 07
- OR
- B Use the bracketing search to find the value of x that minimizes $f(x) = x^4 - 14x^3 + 60x^2 - 70x$. Assume starting point. 07
- Q.3 Minimize $f(x) = x^3 - 12.2x^2 + 7.45x + 42$, over the interval $[1,15]$ using secant method. Perform three iterations 14
 OR
- Q.3 Minimize $f(x) = (2x - 1)^2 + 4(4 - 1024x)^2$, over the interval $[1,15]$ using secant method. Perform three iterations 14
- Q.4 Find the minimizer of $f(x_1, x_2) = \frac{1}{2}X^T \begin{bmatrix} 4 & 2 \\ 2 & 2 \end{bmatrix} X - X^T \begin{bmatrix} -1 \\ 1 \end{bmatrix}$, using the steepest descent method with the initial point $X^T = [0 \ 0]^T$ 14
 OR
- Q.4 Find the minimizer of $f(x_1, x_2) = \frac{1}{2}X^T \begin{bmatrix} 4 & 2 \\ 2 & 2 \end{bmatrix} X - X^T \begin{bmatrix} -1 \\ 1 \end{bmatrix}$, using the fletcher Powell's method with the initial point $X^T = [0 \ 0]^T$. 14
- Q.5 Find the minimizer of $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ using the Powell's conjugate direction method with the initial point $X^T = [0 \ 0]^T$. 14
 OR
- Q.5 Find the minimizer of $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ using the Genetic algorithm. Assume suitable data wherever necessary. 14
