Seat No.: ________ Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER – I (New)– EXAMINATION – WINTER-2019

Subject Code: 3710310 **Date: 02-01-2020**

Subject Name: Optimization Techniques for Engineers

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..**

Q.1 $Maximize\ Z = 7x1 + 6x2$ 14
$subject\ to,$
$x1 + 4x2 \le 4$
$2x1 + x2 \le 3$
$x1, x2 \ge 0$
to get optimal solutions.

Q.2 A Consider the function $f(x) = x^4 - 14x^3 + 60x^2 - 70x$, Use the Fibonacci search method to find the value of x that minimizes $f(x)$ over the range [0,2]. Locate this value of x to within a range 0.3. 07

B Use the Golden Section search to find the value of x that minimizes $f(x) = x^4 - 14x^3 + 60x^2 - 70x$, in the range [0,2] Locate this value of x to within a range of 0.3. 07

OR

B $Minimize\ Z = 2x1 + 3x2$ 07
$subject\ to,$
$4x1 + 2x2 \ge 12$
$x1 + 4x2 \ge 6$
$x1, x2 \ge 0$
Use two-phase simplex method to get optimal solutions.

Q.3 Minimize $f(x) = x^4 + 4\cos x$, over the interval [1,2] using secant method. 14

OR

Q.3 Minimize $f(x) = 8e^{1-X} + 7\log x$, over the interval [1,2], to within an uncertainty of 0.23 using Golden Section method. 14

Q.4 Find the minimizer of $f(x1, x2) = \frac{1}{2}X^T \begin{bmatrix} 4 & 2 \\ 2 & 2 \end{bmatrix} X - X^T \begin{bmatrix} -1 \\ 1 \end{bmatrix}$, using the conjugate gradient method with the initial point $X^T = [0 \quad 0]^T$ 14

OR

Q.4 Find the minimizer of $f(x1, x2) = \frac{1}{2}X^T \begin{bmatrix} 4 & 2 \\ 2 & 2 \end{bmatrix} X - X^T \begin{bmatrix} -1 \\ 1 \end{bmatrix}$, using the newton's method with the initial point $X^T = [0 \quad 0]^T$. 14

Q.5 Find the minimizer of $f(x1, x2) = x_1 - x_2 + 2{x_1}^2 + 2x_1x_2 + {x_2}^2$ using the Hooke and jeeves method with the initial point $X^T = [0 \quad 0]^T$, $\Delta X^T = [0.8 \quad 0.8]^T\ and\ \varepsilon = 0.1$. 14

OR

Q.5 Find the minimizer of $f(x1, x2) = x_1 - x_2 + 2{x_1}^2 + 2x_1x_2 + {x_2}^2$ using the Rosenbrock's method with the initial point $X^T = [0 \quad 0]^T$, $\Delta X^T = [0.8 \quad 0.8]^T\ and\ minimum\ permissible\ step\ length\ \varepsilon = 0.15, \alpha = 3, \beta = 0.5$. 14

****