Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech.(CSE) (O.E. 2011 Onwards) (Sem-6)

OPTIMIZATION TECHNIQUES

Subject Code : CH-304

Paper ID : [A2643]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. What is discontinuous function? How can one check the continuity of a function?
2. Give the classification of optimization problems.
3. Consider the objective function : $f(x_1, x_2) = 6x_1^2 + 6x_1x_2 + x_2^3 + 3x_2^2$. Is it convex?
4. State the Kuhn-Tucker conditions.
5. Find the volume of the largest right circular cylinder that can be inscribed inside a Sphere of radius R.
6. What is difference between local optimal point and global optimal point?
7. State disadvantages of Newton's method for one-dimensional search.
8. What is basic feasible solution in simplex method?
9. Define the property of continuity.
10. What are the characteristics of direct search methods?

SECTION-B

11. Consider the objective function,

$$f(x) = x_1^2 + 2x_1 + 3x_2^2 + 6x_2 + 4$$

Find the stationary points and classify them using the Hessian matrix.

12 Find the dimensions of a cylindrical tin (with top and bottom) made up of a sheet metal to maximize its volume such that the total surface area is equal to 22π.

13. Minimize $f(x) = x^4 - x + 1$ using Newton's method, starting point $x = 0.3$.

14. Locate the minimum value of a function $f = (x - 30)^2$ to within an accuracy of 1% if the initial range of search is $0 \le x \le 100$ by using golden section method.

15. Apply golden section search technique to reduce the interval of uncertainty for the maximum of the function $f = 6.64 + 1.2x - x^2$, from [0, 1] to less than 2% of its original size.

SECTION-C

16. Find the minimum of $f = x\,(x - 1.5)$ in the interval (0,1) to within 5% of the exact value, using interval halving method.

17. Estimate the minimum of $f(x) = 3x^2 + \frac{12}{x^3} - 5$ in the interval $\frac{1}{2} \le x \le \frac{5}{2}$.

by using Powell's Method, with initial point $x1 = 0.5$ and step size $\Delta = 0.5$. For convergence parameters use

$$\left|\frac{Difference\ in\ x}{x}\right| \le 3 \times 10^{-2} \ and \ \left|\frac{Difference\ in\ F}{F}\right| \le 3 \times 10^{-3}$$

18. The function $f(x) = \left(1 + 8x_1 - 7x_1^2 + \frac{7}{3}x_1^3 - \frac{1}{4}x_1^4\right)(x_2^2 e^{-x_2})F(x_3)$

Has two maxima and one saddle point. For

(*a*) $F(x_3) = 1$ *and* (*b*) $F(x_3) = x_3 e^{-(x_3+1)}$

Locate the global optimum by a search technique.