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B.E. (Computer Science & Engineering) Eighth Semester (C.B.S.)

Elective - III : Optimization Techniques

P. Pages : 2 **NJR/KS/18/4750**

Time : Three Hours * 0 6 2 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the classification of Optimization technique. **7**

b) What is graphical optimization and what are its limitation. **6**

OR

2. a) What are objective function contours? Suggest a simple method of handling multiple objectives in an optimization problem. **8**

b) State five engineering applications of optimization. **5**

3. Explain various optimization techniques to find the local minimal point in a single variable function. **13**

OR

4. What is global optimization? Explain in detail with an example & list its advantages? **13**

5. a) Minimize the function **8**

$$f(x) = x^2 + 54/x$$

by using Fibonacci search method.

b) Explain successive quadratic estimation methods in detail. **6**

OR

6. a) How the issues are removed in Fibonacci Search method & how the golden search method are implemented. Explain with an example. **8**

b) Find the minimum of the function $f(\lambda) = 0.65 - \frac{0.75}{1+\lambda_2} - 0.65\lambda \tan^{-1}\frac{1}{\lambda}$ by using Newton Raphson method with the starting point $\lambda_1 = 0.1, \in = 0.01$. **6**

7. a) Explain Powell's conjugate direction method in detail? **8**

b) How Marquardt method attempts to take advantage of both the steepest descent and Newton methods. Explain in detail. **6**

OR

8. a) Explain Hooke - Jeeves Pattern search method in detail. **6**

b) What are optimality criteria of multivariable optimization algorithm. **8**

9. Explain transformation technique. Find the dimensions of a rectangular prism - type box that has the largest volume when the sum of its length, width and height is limited to a maximum value of 60 in and its length is restricted to a maximum value of 36 in. **13**

OR

10. a) **7**

Minimize $\left(x_1^2 + x_2 - 11\right)^2 + \left(x_1 + x_2^2 - 7\right)^2$

Subject to $(x_1 - 5)^2 + x_2^2 - 26 \geq 0,$

$x_1,\ x \geq 0$

using penalty function method.

b) **6**

Minimize $f(x) = \left(x_1^2 + x_2 - 11\right)^2 + \left(x_1 + x_2^2 - 7\right)^2$

Subject to $g_1(x) = 26 - (x_1 - 5)^2 - x_2^2 \geq 0,$

$g_2(x) = 20 - 4x_1 - x_2 \geq 0$

$x_1,\ x_2 \geq 0$

by using Kuhn tucker points method.

11. Maximize $f = x_1 + 2x_2 + x_3$ **13**

Subject to $2x_1 + x_2 - x_3 \leq 2$

$-2x_1 + x_2 - 5x_3 \geq -6$

$4x_1 + x_2 + x_3 \leq 6$

$x_i \geq 0,\ \ i = 1, 2, 3$

OR

12. a) Write a short note on : **6**

1) Sensitivity analysis of linear programming.

2) Duality theory in linear programming.

b) Explain Frank - Wolfe linear search method in detail. **7**

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Itâ€™s hard to beat a person who never gives up.

~ Babe Ruth