

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 140657

Roll No.

B.TECH.

Theory Examination (Semester-VI) 2015-16

OPTIMIZATION TECHNIQUES IN ENGINEERING

Time : 3 Hours

Max. Marks : 100

Section-A

1. Attempt all question. All questions carry equal mark. Write answer of each question in short. (2×10=20)

- (a) Explain local and global optimum.
- (b) What is the necessary condition for local minimum and maximum value?
- (c) Write Kuhn-Tucker sufficient condition for function.
- (d) Explain direct substitution method.
- (e) What is a return function?
- (f) Why SLP method is called the cutting plane method?
- (g) Write algorithm for Simpsons 1/3 rule.

- (h) Write the expression for Newton-Raphson method in two dimension case.
- (i) What is Genetic operator?
- (j) What is 'branching' in branch and bound method?

Section-B

2. Attempt any five parts of the following. (10×5=50)

- (a) Consider the function :

$$f(x) = x_1 + 2x_2 + x_1x_2 - x_1^2 - x_2^2$$

Determine the maximum or minimum point (if any) of the function.

- (b) Obtain necessary conditions for the optimum solution of the following problem :

$$\text{Minimize } f(x_1, x_2) = 3e^{(2x_1+1)} + 2e^{(2x_2+5)}$$

$$\text{Subject to } g(x_1, x_2) = x_1 + x_2 - 7 = 0$$

- (c) Use the method of Lagrangian multiplier to solve the following NLP problem. Does the solution maximize or minimize the objective function?

$$\text{Optimize } Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$$

$$\text{Subject to the constraint } g(x) = x_1 + x_2 + x_3 = 20$$

$$\text{And } x_1, x_2, x_3 \geq 0$$

(d) Explain goal programming method.

(e) Minimize $f = -3x_1 - 4x_2$

Subject to $3x_1 - x_2 + x_3 = 12$

$$3x_1 + 11x_2 + x_4 = 66$$

$$X_i \geq 0, i = 1 \text{ to } 4$$

Using cutting plane method.

(f) Solve the following LP problem using the branch and bound method:

Maximize $f = 3x_1 + 4x_2$

Subject to $7x_1 + 11x_2 \leq 88$

$$3x_1 - x_2 \leq 12$$

$$X_1 \geq 0$$

$$X_2 \geq 0$$

(g) Derive the expression for Simpson's 3/8 rule.

(h) Evaluate $\int_0^6 \frac{dx}{1+x^2}$

By using (i) Trapezoidal rule

(ii) Simpson's 1/3 rule

Section-C

Note: Attempt any two parts of the following. (15×2=30)

3. Show that line of fit to the following data is $y = 0.72 + 1.33x$

x	0	1	2	3	4
y	1.0	1.8	3.3	4.5	6.3

4. Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$

From the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$

Using Marquardt method with :

$$\alpha_1 = 10^4$$

$$c_1 = 0.25$$

$$c_2 = 2$$

$$\text{And } \epsilon = 10^{-2}$$

5. Explain stochastic linear programming.