Printed Pages: 4 NME-011

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

Paper ID : 140661 Roll No. | | | | | | | | | | |

B.TECH.

Theory Examination (Semester-VI) 2015-16

ENGINEERING OPTIMIZATION

Time : 3 Hours *Max. Marks : 100*

Section-A

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

   (a) Write the linear programming problem in standard form.

   (b) What is a Pivot operation?

   (c) State the Kuhn-Tucker conditions.

   (d) What is the difference between Newton and Quasi-Newton method?

   (e) What is the limitation of the linear extended penalty function?

   (f) How is the direction-finding problem solved in Zoutendijk's method?

problem.

Section-B

2. Attempt any five questions from this section.

(10×5=50)

(a) Maximize $f = x_1+2x_2+x_3$

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

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

$x_1+2x_2+x_3 \le 6$

$x_i \ge 0, \quad i = 1, 2, 3$

Using simplex method.

(b) Minimize $f(x_1, x_2) = (x_1-1)^2 - x_2^2$

Subject to $g_1(x_1, x_2) = x_1^3 - 2x_2 \le 0$

$g_1(x_1, x_2) = x_1^3 + 2x_2 \le 0$

Using the cutting plane method. Take the convergence limit in step 5 as = 0.02.

(e) Derive the expression for solution of an Unconstrained Geometric Programming program using Differential Calculus.

(f) In a certain reservoir pump installation, the first cost of the pipe is given by (100 D+ 50 D^2), where D is the diameter of the pipe in cm. The cost of the reservoir decreases with an increase in the quantity of fluid handled and is given by 20/Q, where Q is the rate at which the fluid is handled (cubic meters per second). The pumping cost is given by ($300Q^2/D^5$). Find the optimal size of the pipe and the amount of fluid handled for minimum overall cost.

(g) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using CAUCHY METHOD.

(h) What are the Rank 1 and Rank 2 Updates in QUASI-NEWTON Methods?

Section-C

Attempt any two questions from this section. (15×2=30)

3. Explain the Exterior Penalty Function Method with suitable example.

4. Solve the following LP problem using the branch and bound method:

   Maximize $f = 3x_1 + 4x_2$

   Subject to

   $$7x_1 + 11x_2 \le 88$$
   $$3x_1 - x_2 \le 12$$
   $$X_1 \ge 0$$
   $$X_2 \ge 0$$

5. Design a helical spring for minimum weight subject to a constraint on the shear (τ) induced in the spring under a compressive load P.

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