Total No. of Questions : 8]

P4671

SEAT No. :

[Total No. of Pages : 3

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M.E. (Mechanical) (Design Engineering)

OPTIMIZATION TECHNIQUES (Elective - I(C))

(Semester - I) (2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

1) *Attempt any 3 questions from each section.*
2) *Answer to each section must be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of pocket calculator is allowed.*
6) *Assume suitable data wherever necessary.*

SECTION - I

Q1) a) What is the difference between linear programming and non linear programming? **[4]**

b) A retail store stocks and sells three different models of TV sets. The store cannot afford to have an inventory worth more than Rs. 4,50,000 at any time. The TV sets are ordered in lots. It costs Rs. a_j for the store whenever a lot of TV model j is ordered. The cost of one TV set of model j is c_j. The demand rate of TV model j is d_j units per year. The rate at which the inventory costs accumulate is known to be proportional to the investment in inventory at any time, with $q_j = 0.5$, denoting the constant of proportionality for TV model j. Each TV set occupies an area of $s_j = 0.40m^2$ and the maximum storage space available is $90m^2$. The data known from the past experience are given below. **[12]**

	TV model j		
	j = 1	j = 2	j = 3
Ordering cost, a_j (Rs.)	50	80	100
Unit cost,c_j (Rs.)	40	120	80
Demand rate, d_j	800	400	1200

Formulate the problem of minimizing the average annual cost of ordering and storing the TV sets.

P.T.O.

Q2) a) What is the difference between a simplex method and simplex algorithm? **[4]**

b) Find all the basic solutions corresponding to system of equations by pivotal reduction method **[12]**

$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$

$x_1 + x_2 + x_3 + 3x_4 = 6$

$x_1 - x_2 + x_3 + 5x_4 = 4$

Q3) a) What is convex set and nonconvex sets? **[4]**

b) Solve below problem using simplex method **[12]**

Maximize $f = -100\, x_1 + 50\, x_2$

Subject to constraints

$400\, x_1 - 200\, x_2 \leq 25000$

$20x_1 + 30x_2 \leq 9000$

$20x_1 + 30x_2 \leq 9000$

$x_1 \geq 0$

$x_2 \geq 0$

Q4) a) Minimize $f(x) = (200 - 2x^2)$ over the interval $60 \leq \times \leq 150$ by half interval method. **[8]**

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

starting from point $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ by using conjugate gradient method. **[10]**

SECTION - II

Q5) a) Find minimization of the function **[8]**

$F(\lambda) = 0.65 - 0.75\ /(1 + \lambda^2) - 0.65\ \lambda \tan^{-1} 1/\lambda$

Using Newton method with starting point

$\lambda_1 = 0.1$; Use $\varepsilon = 0.01$

b) Minimize $f(x) = 0.1\, x_1 + 0.05773\, x_2$ **[8]**

Subject to

$$G_1(x) = \frac{0.6}{x_1} + \frac{0.3464}{x_2} - 0.1 \leq 0$$

$G_2(x) = 6 - x_1 \leq 0$

$G_3(x) = 7 - x_2 \leq 0$

Solve using sequential quadratic programming method.

Q6) a) Minimize $f(x_1, x_2, x_3) = (x_1 - x_2)^2 + (x_2 - x_3)^4$ **[12]**

Subject to

$G_1(x) = 2x_1(1 + x_2^2) + 2x_3^4 - 6 = 0$

$-3 \leq x_1 \leq 3, l = 1,2,3$

Using Generalized Reduced Gradient method

b) Write a short note on **[6]**

i) Penalty function method

ii) Conjugate gradient method

Q7) a) What is a Lagrange multiplier? What is the significance of a Lagrange multiplier? Give examples for intepretation of a lagrange multiplier.

b) What is basic and non basis variables? Give example

c) What is feasible and infeasible region? Give example

d) What is unbounded and bounded feasible region? Give example.

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Q8) Minimize $f(x_1, x_2) = x_1^2 + x_2^2 - 2x_1 - 2x_2 + 2$ subject to $g_1 = -2x_1 - x_2 + 4 \leq 0$, $g_2 = -x_1 - 2x_2 + 4 \leq 0$.

Minimize $f(x_1, x_2)$ using Kuhn-Tucker conditions. **[16]**