

Model Question Paper
SECOND SEMESTER M.Tech Degree
(2013 sceme)

CSE 2003 : Structural Optimization

Time: 3 hours

Max. : 60 marks

Answer any two questions from each module

Part I

1. A) State the optimality criteria for multivar unconstrained optimization and find the extreme points of the function
 $f(x,y) = x^3 + y^3 + 2x^2 + 4y^2 + 6$ (8)
B) Write the duality theorems (2)
2. Use the method of Lagrange Multipliers to find the dimensions of a cylindrical tin (with top and bottom) made up of sheet metal to maximize the volume such that the total surface area is equal to $A_0 = 24\pi$ (10)
3. A) Find min of $f = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$
From the starting point $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ using Powell's direction method (7)
B) Write a short note on the Transformation techniques used in Optimization. (3)

Part II

4. A) Solve the minimization problem using Rosen's gradient projection method (7)
 $f = x_1^2 + x_2^2 - 2x_1 - 4x_2$
 $g1 = x_1 + 4x_2 - 5 \leq 0$
 $g2 = 2x_1 + 3x_2 - 6 \leq 0$
 $g3 = -x_1 \leq 0$
 $g4 = -x_2 \leq 0$
B) Write a note on the different types of penalty terms used in optimization and mention whether they are used in interior or exterior penalty function (3)
5. A) Minf = $1/3(x_1 + 1)^3 + x_2$

Subject to

$$g1: -x_1 + 1 \leq 0$$

$$g2: -x_2 \leq 0 \quad \text{using penalty function method} \quad (7)$$

B) write the Kuhn Tucker conditions (3)

6. A Manufacturing firm producing small refrigerators has entered into a contract to supply 50 refrigerators at the end of the first month, 50 at the end of the second month and 50 at the end of the third month. The cost of producing x refrigerators is given by $\$(x+1000)$. The firm can produce more refrigerators in any month and carry them to the subsequent month. However, it costs \$ 20 per unit for any refrigerator carried over from one month to the next. Assuming that there is no initial inventory, determine the number of refrigerators to be produced each month to minimize the total cost. (10)

Part III

7. Using DFP method evaluate min of $f = x - y + 2x^2 + 2xy + y^2$
From the starting point $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ (10)
8. A) Write the algorithm for simplex search method (2.5)
- B) Using Fletcher Reeves method, evaluate min of $f = x - y + 2x^2 + 2xy + y^2$ (7.5)
9. Using 2 phase simplex method, evaluate
Min $f = 2x_1 + x_2$
subject to
 $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 3$
 $x_1, x_2 \geq 0$ (10)