B. Tech.

(SEM. VIII) EXAMINATION, 2006-07

OPTIMIZATION TECHNIQUES IN CHEMICAL ENGG.

Time : 3 Hours] [Total Marks : 100

Notes : Attempt all questions. All question carry equal marks. In case of numerical problems assume data if found missing.

1 Attempt any four parts of the following : 5×4=20

(a) What is quasi-netwon method for unconstrained one dimensional search ?

(b) Differentiate between constrained and unconstrained problem with an example.

(c) What is discontinuous function ? How one can check the continuity of a function ?

(d) Explain the secant method for uni-dimensional search.

(e) What do you understand by convex function and concave function? Explain.

(f) Find the minimum and maxima values of the function

\[ y = 2x^3 - 5x^2 - 8x + 3 \text{ if } -3 \leq x \leq 3 \]

V-9098] 1 [Contd...
2 Attempt any **four** parts of the following : \[5 \times 4 = 20\]
(a) Using graphical method:
Minimize: \[f = 3x_1 + 2x_2\]
Subject to \[8x_1 + x_2 \geq 8\]
\[2x_1 + x_2 \geq 6\]
\[x_1 + 3x_2 \geq 6\]
\[x_1 + 6x_2 \geq 8\]
\[x_1 \geq 0, \ x_2 \geq 0\]

(b) What is random search method for unconstrained multi variable ?
(c) What is bisection method? Explain with an example.
(d) Describe the uses of optimization techniques in chemical engg.
(e) What are the various indirect method for multivariable search? Discuss any one
(f) What do you understand from sensitivity analysis in an LPP? What is the advantage of carrying out sensitivity analysis?

3 Attempt any **two** of the following: \[10 \times 2 = 20\]
(a) Find by dichotomous search the minimum of
\[y = 10x^2 - 3x + 5\]
subject to \[g = x^2 - 5 \leq 0\]

(b) Use the Fibonacci method to obtain the maximum value of the function \[y = 9x - 0.1x^2\] in the range \[0 \leq x \leq 100\] within an accuracy of 0.1 percent of the original range. Calculate up to 5 interaction only.

V-9098] 2 [Contd...
(c) Locate the minimum value of the function \( y = (x - 30)^2 \) to within an accuracy of 1% if the initial range of search is \( 0 \leq x \leq 100 \) by using Golden section method. Calculate upto 5 iteration only.

4 Attempt any two of the following : 10×2=20

(a) Solve the given transportation problem, using Vogel's approximation method :

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<thead>
<tr>
<th>Source</th>
<th>Supply</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>12</td>
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<tr>
<td>3</td>
<td>14</td>
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Demand 5 15 15 10

(b) Solve the given LPP by M-technique (Method of penalty) :
Minimize \( Z = 4x_1 + x_2 \)
Subject to \( 3x_1 + x_2 = 3 \)
\( 4x_1 + 3x_2 \geq 6 \)
\( x_1 + 2x_2 \leq 4 \)
\( x_1, x_2 \geq 0 \)

(c) What is two phase technique for solving LPP. Explain the method thoroughly with an example.

V-9098] 3 [Contd...
5 Attempt any one of the following:  

(a) What do you understand by dynamic programming? Explain with an example of triple effect evaporator. Also show by block diagram.

(b) Solve the given LPP by dynamic programming

Max. \( Z = 2x_1 + 5x_2 \)

Subject to \( 2x_1 + x_2 \leq 430 \)
\( 2x_2 \leq 460 \)
\( x_1, x_2 \geq 0 \)