



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

**PAPER ID : 151654**

Roll No.

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## B. Tech.

(SEM. VI) THEORY EXAMINATION, 2014-15  
**OPTIMIZATION TECHNIQUE IN CHEMICAL  
ENGINEERING**

Time : 2 Hours]

[Total Marks : 50

Note : (1) Attempt All questions.

(2) Assume suitable data, if required.

1 Attempt any four parts of the following. **3x4=12**

- (a) Find the volume of the largest rectangular solid inscribed in the ellipsoid.

$$\left\{x^2/a^2\right\} + \left\{y^2/b^2\right\} + \left\{z^2/c^2\right\} = 1$$

- (b) Find the maximum and minimum values of the function.

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 5$$

- (c) Find the maximum and minimum values of the function.

$$f(x, y) = x^3 + y^3 - 3x - 12y + 25$$

- (d) Enumerate the Scope and limitations of optimization techniques.
- (e) Write short note on “Feasible solution and feasible region”.
- (f) Discuss about constrained optimization problems.

2 Attempt any two parts of the following. **7x2=14**

- (a) Define a linear programming problem. Solve the following linear programming problem (LPP) by graphical method.

Maximize  $5x + 3y$

Subject to

$$4x + 5y \leq 10$$

$$5x + 2y \leq 10$$

$$3x + 8y \leq 12$$

$$\text{and } x \geq 0, y \geq 0$$

- (b) Solve the following LPP graphically.

$$\text{Min } z = 2x_1 + x_2$$

$$\text{Subject to } 3x_1 + x_2 \geq 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \geq 2$$

$$\text{and } x_1, x_2 \geq 0$$

- (c) Find the maximum of  $f = x(1.5 - x)$  in the interval  $(0, 0.100)$  within 10% of exact value.

3 Attempt any two parts of the following : **6×2=12**

- (a) Define a transportation problem. Prove that every transportation problem has a feasible solution.
- (b) Obtain a basic feasible solution of the following transportation problem.

3	5	6	4	1700
6	8	2	3	1900
5	7	4	11	1000
8	5	13	10	1400
1000	1200	1500	2300	

- (c) Describe Fibonacci search method for a unimodal function of a single variable.

4 Attempt any two parts of the following. **6x2=12**

- (a) Discuss the scope and hierarchy of optimization.
- (b) State Newton-Raphson method for finding the points of maximum/minimum of an universal function. Hence find the point of minimum of the function.

$$f(x) = x^2 + 54/x$$

- (c) Find the dimensions of cylindrical tin (with top and bottom) made up of sheet metal to maximize its volume such that the total surface area is equal to  $A_0 = 24\pi$ .