Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– III • EXAMINATION – SUMMER 2015

Subject Code: 733001 **Date: 30/04/2015**

Subject Name: Advance Process Optimization

Time: 2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) A refinery uses two grades of crude to produce four products. Gasoline, kerosene, fuel oil and residual oil. The data given are as follow: **14**

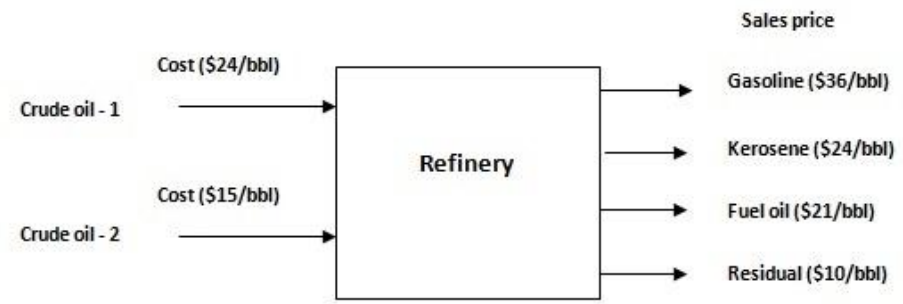

Table: Data for the refinery inputs and products:

	Volume percent yield		**Maximum allowable production bbl/day**
	Crude -1	**Crude 2**	
Gasoline	80	44	24000
kerosene	5	10	2,000
fuel oil	10	36	6,000
residual	5	10	-
Processing cost ($/bbl)	0.50	1.00	-

Find the quantity of crude 1 and crude 2 to be processed to maximize profits.

Q.2 (a) A box with a square base and open top is to hold 1000 cm^3. Find the dimensions that require the least material to construct the box. **07**

(b) A length of wire 100 cm is to cut in two parts. One portion is to be bent into the form of a circle, and the other into the form of a square. From where it must be cut, if the sum of the areas enclosed by the circle and square is to the least possible? **07**

OR

(b) Discuss Simulated Annealing. **07**

Q.3 (a) Find the values of x_1 and x_2 which minimize the function, **07**

$$y = x_1^2 + 4x_2^2 - 4x_1$$

subject to the restriction that,

$$2x_2 \text{ ï } x_1 = 12.$$

Use Lagrangian Multiplier method

(b) Discuss Genetic Algorithm. **07**

OR

Q.3 **(a)** Search for the minimum of the objective function. **07**

$$y = 6x_1^2 + 3x_2^2$$

Using the Univarient approach. Terminate the search after each of the Co-ordinate directions has been searched three times.

(b) Write a short note on Multi Objective Optimization. **07**

Q.4 **(a)** Minimize $y = 10(x_1 + x_2 -5)^2 + (x_1 ï x_2)^2$ by using Powell method **07**

(b) Discuss optimization of Liquid-Liquid Extraction process. **07**

OR

Q.4 **(a)** By using Fibonacci Search method Locate the minimum value of the function represented by $y = (x ï 30)^2$ to within an accuracy of 1% if the initial range of search is 0Òx Ò100. **07**

(b) Find the value of x in the interval (0,1) which minimizes the function $f = x(x-1.5)$ with ± 0.05 using Golden Section search technique. **07**

Q.5 **(a)** Find the minimum of the function y, where **07**

$$y = 4x_1^2 + 5x_2^2$$

subject to the restriction

$$2x_1 + 3x_2=6$$

Use a Penalty Function method.

(b) The original problem is to find the minimum of the function **07**

$$y = 3x_1 + 5x_2$$

subject to the restriction that

$$x_1 +3x_2 Ó14$$
$$2x_1 ï x_2 Ó2$$
$$x_1 ï 4x_2 Ò2$$
$$x_1 + x_2 Ò20$$

With x_1 Ó0 and x_2 Ó0.

Construct the dual for this problem and solve it.

OR

Q.5 **(a)** Find the locations and determine the nature of the stationary values of the unrestricted functions **07**

i. $y = -3x^4 + 10x^3 -20$

ii. $y = x^4 -8x^3 + 24x^2 -32x +16$

(b) Explain the interpretations with examples for **07**

- Å Zero coefficients in column.
- Å No positive ratio.
- Å Identical values of smallest positive ratio.

While solving any linear programming problem using simplex method.

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