Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII EXAMINATION – SUMMER 2016

Subject Code:180503 **Date:07/05/2016**

Subject Name:Process Simulation & Optimization

Time:10:30 AM to 01:00 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)	Explain Partioning and Tearing in detail.	07
	(b)	Define & explain following: Signal flow graph Successor digit Mode denomination	**07**
Q.2	**(a)**	Discuss Newton's method of convergence promotion. Using this method solve equation x^2-2=0 with initial guess of x=2.	**07**
	(b)	A cross channel ferry is constructed so as to transport a fixed number of tons across each way per day. If the cost of construction of the ferry without the engine varies as the load, and the cost of the engines varies as the product of the load the cube of the speed, prove that the total cost of construction is least when twice as much money is spent on the ferry as on the engines.	**07**
		OR	
	(b)	Write necessary any sufficient condition for an extreme value of multivariable objective function and find out stationary point for $Y= 1+8x+2x^2-10/3\ x^3-1/4\ x^4 + 4/5\ x^5- 1/6\ x^6$	**07**
Q.3	**(a)**	You are assigned to design an open-topped rectangular tank whose total area is to be 108 m^2. If a maximum volume is required, formulated the problem and solve it.	**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 or Fibonacci search technique.	**07**
		OR	
Q.3	**(a)**	Explain the application of optimization in fitting vapour-liquid equilibrium data.	**07**

(b) Maximize **07**
$f(x)= 0.65 – (0.75/ (1+ x^2)) – 0.65 (x \tan^{-1}(1/x))$
in the interval (0,3) by the Fibonacci search technique.
using n=2.

Q.4 **(a)** Find the maximum of **07**
$Y = 10x_1^2 – 4 x_1x_2 + 3x_2^2 + 5 x_2x_3$
Subject to $x_1 + 2x_2 \leq 3$, $x_2-x_3 \geq 2$, $x_1 \geq 1$ using lagrangian multipliers.

(b) List out the techniques/methods which can be used to solve the optimization problem: find the minimum of $y= 4 x_1^2+ 5 x_2^2$ **07**
subject to $2x_1 + 3x_2= 6$.
Solve it using any method of your choice.

OR

Q.4 **(a)** Find the global minimum and maximum of the function $y=x_2- x_1^2$ if it is subject to the restriction that $1- x_1^2- x_2^2 = 0$ using the penalty function method. **07**

Q.4 **(b)** Minimize the function $y= (x-3)^2$ subject to the restriction $x \geq 1$. **07**

Q.5 **(a)** Find the minimum of the function **14**
$Y= 6x_1 + x_2$
Subject to the restrictions
$3x_1 + 5x_2 \leq 13$
$6x_1 + x_2 \leq 12$
$4x_1 + 3x_2 \leq 12$
With $x_1 \geq 0$ and $x_2 \geq 0$

Construct the objective function contours in feasible region.

Note : if multiple solution exists then find out four possible solutions.

OR

Q.5 **(a)** Maximixe $z=3x_1 + 5 x_2$ **07**

subject to $x_1 \leq 4$

$x_2 \leq 6$

$3 x_1 + 2x_2 \leq 18$

With $x_1 \geq 0$ and $x_2 \geq 0$

(b) Discuss the optimization of pipe diameter. **07**

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