Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER III–EXAMINATION – WINTER 2015

Subject code: 2730504 **Date: 04/12/2015**

Subject Name: Introduction to Optimization Techniques

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)** An electronics company produces two products A and B. Products are produced and sold on weekly basis. The weekly production can not exceed 15 for product A and 25 units for product B because of limited available facility. The company employs 50 workers. Product A requires 2–man week of labor hours while Product B requires 1–man week of labor hours. **Formulate** the linear programming problem, for maximizing profit if the profit margins on A and B are Rs. 500/- and Rs. 600 , respectively. **07**

(b) What is meant by Optimization? Explain the scope of Optimization in Electronics Engineering and state its applications. **07**

Q.2 **(a)** Explain Fibonacci Method for solution of one dimensional nonlinear problem. **07**

(b) Use branch and bound method to solve following Integer linear problem. **07**
Max $7x_1 + 9x_2$ Subject to $-x_1 + 3x_2 <= 6$; $7x_1 + x_2 <= 35$; $x_1 <= 7$; $x_2 <= 7$. $x_1, x_2 > = 0$ and x_1, x_2 are integers.

OR

(b) Explain the general form of multivariable optimization problem with equality constraints. Discuss solution of the same with the help of Lagrange multiplier and derive necessary condition of a problem with two variables and one constraint. **07**

Q.3 **(a)** A company has three plants with cost matrix, capacities and demands as given as below: **07**

				Capacities
	1	2	3	**6**
	4	3	2	**8**
	0	2	2	**10**
Demands	**4**	**6**	**8**	

Obtain the optimal solution to the following minimization problem. Use NWCM for initial feasible solution and MODI method for optimal solution.

(b) Explain with necessary details -fuzzy membership functions and steps of Fuzzy Inference Systems. **07**

OR

Q.3 **(a)** Explain in brief about assignment problem in engineering optimization. **07**
Solve the minimization problem using Hungarian method for the matrix given below:

10	5	13	15
3	9	18	3
10	7	3	2
5	11	9	7

(b) Explain in brief Multi-objective Optimization problem and its solution. **07**

Q.4 **(a)** Consider the following LPP. **07**

Max $Z = 3x_1 + 5x_2$

S t: $3x_1 + 2x_2 \leq 18$

$x_1 \leq 4$

$x_2 \leq 6$

$x_1, x_2 \geq 0$

a) Convert into the Standard form.
b) Obtain the Basis variable and Basis Table
c) Find the Optimum Feasible Solution for the following problem using appropriate form of Simplex Method.

(b) With reference to Computing based Optimization, differentiate between Deterministic Algorithms and Stochastic Algorithms. Explain with examples for the both approaches. **07**

OR

Q.4 **(a)** Consider the following LPP **07**

Minimize $Z= 600X_1+500X_2$

subject to constraints,

$2X_1+ X_2 \geq 80$

$X_1+2X_2 \geq 60$ and

$X_1,X_2 \geq = 0$

a) Convert the LP problem into a system of linear equations.
b) Obtain a Basic Solution to the problem.

Obtain the Optimum Solution using 'Big M' Method.

Q.4 **(b)** The cost of establishment of a Base station for Wireless Mobile Communication (in Lakhs/year) varies with the coverage and is given by $0.2x^2$ where x is the radial distance in km. The fixed cost of hull, wiring and set-up is given by 450/x. **07**

Determine the Operating range of the Base station with minimum total cost using Genetic Algorithm.

Consider the original inerval of unceertainty as $4 \leq x \leq 16$ km.

Q.5 **(a)** Obtain the general solution of Travelling Salesman type Problem using Ant Colony Optimization. Also explain the Algorithm associated with ACO. **07**

(b) Consider the following function. **07**

Maximize $f(x) = x^3-12x^2+45x$

a) State the Equation of Position Update for Particle Swarm Optimization Technique along with the constants used. Consider 5particles.
b) Initialise the requisites in the range of [0,2)

Using Particle Swarm Optimization Technique, **calulate first two iterations** to find the Optimum Feasible Solution.

OR

Q.5 **(a)** What is the Physical interpretation of the term 'Simulated Annealing'. Describe an Algorithm explaining the Simulated Annealing as a modern Method of Optimization. **07**

(b) For establishment of Wireless mobile Network, a link budget is considered with the following parameters: **07**

- Range of Power = 10 to 30 dB
- Range of Antenna Tilt = 5 to 15 degrees
- Range of Azimuth Angle = 1 to 2 degrees

a) Design an Appropriate Orthogonal Array for the above mentioned parameters.

b) Obtain Inner and Outer Array for Taguchi Design.

Obtain the Optimal Values of the given parameters using Taguchis Method of optimization.

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