Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech.

SEM: II - THEORY EXAMINATION (2021 - 2022)

Subject: Optimization Techniques

Time: 3 Hours   Max. Marks: 70

General Instructions:

1. The question paper comprises three sections, A, B, and C. You are expected to answer them as directed.

2. Section A - Question No- 1 is 1 marker & Question No- 2 carries 2 marks each.

3. Section B - Question No-3 is based on external choice carrying 4 marks each.

4. Section C - Questions No. 4-8 are within unit choice questions carrying 7 marks each.

5. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A   15

1. Attempt all parts:-

1-a.   Optimization techniques help the directing authority in optimum allocation of various   1
limited resources like_____ [CO1]

           (a) Men and Machine

           (b) Money

           (c) Material and Time

           (d) All of the above

1-b.   Graphical method is also known as _____.[CO2]   1

           (a) Simplex Method

           (b) Dual Simplex Method

           (c) Big-M Method

           (d) Search-Approach Method

1-c.   Which of the following is not a requirement for a goal programming problem? [CO3]   1

           (a) prioritization of goals

           (b) a single objective function

           (c) linear constraints

(d) linear objective function

1-d.   For a Markov chain X n with state space S,   1

$pij=P[Xn+1=j/Xn=i]]$ for all $i,j \in$, then [CO4]

         (a) pij are called n step transition probabilities.

         (b) pij are called (j-i) step transition probabilities.

         (c) pij are called transition probabilities of order n

         (d) pij are called one- step transition probabilities from state i to state j.

1-e.   Which of the following is used for blocking the phage-encoded recombination?. [CO5]   1

         (a) Mutation in D gene

         (b) Mutation in E gene

         (c) Red mutation

         (d) Mutation in S gene

2. Attempt all parts:-

2.a.   Explain unrestricted search method. [CO1]   2

2.b.   What do you mean by canonical form of LPP? [CO2]   2

2.c.   What is the distribution for service time and inter arrival time? [CO3]   2

2.d.   What do you understand by the geometric problem? [CO4]   2

2.e.   What is a Mutation [CO5]   2

SECTION B   20

3. Answer any <u>five</u> of the following:-

3-a.   Explain a single variable optimization technique. [CO1]   4

3-b.   State and explain the necessary and sufficient conditions for existence of relative optima in   4
case of multivariable optimization with constraints.[CO1]

3-c.   The Handy-Dandy Company wishes to schedule the production of a kitchen appliance that   4
requires two resources – labour and material. The company is considering three different
models and its production engineering department has furnished the following data The
supply of raw material is restricted to 200 pounds per day. The daily availability of labour is
150 hours. Formulating this as a linear programming model to determine the daily
production rate of the various models in order to maximize the total profit.   [CO2]

3-d.   Write the algorithm to solve LPP using Graphical method for maximization of profit. [CO2]   4

3.e.   What are the roles of univariate and pattern moves in the Powell's method? [CO3]   4

3.f.   Solve the following mixed integer programming problem by using Gomory's cutting plane   4
method Maximize: Z= X1+X2 ; subject to 3X1+2X2 ≤ 5; X2 ≤ 2; X1, X2 ≥ 0 X1 is
integer. [CO4]

3.g.   Explain the computational procedure used in dynamic programming. Also write down the   4
application area of dynamic programming. [CO5]

<p align="center">SECTION C   35</p>

4. Answer any <u>one</u> of the following:-

4-a.   A funnel, in the form of right circular cone is to be constructed from a sheet metal. Find the   7
dimensions of the funnel for minimum lateral surface area when the volume is specified
$200cm.^3$ [CO1]

4-b.   Find the dimensions of a cylindrical tin (with top and bottom) made up of sheet metal to   7
maximize its volume such that the total surface area is equal to $A_0 = 24\pi$. [CO1]

5. Answer any <u>one</u> of the following:-

5-a.   Use simplex method to solve the following LP problem   [CO2]   7
Maximize Z= x1+x2+3x3
Subject to : 3x1+2x2+x3≤3
            2x1+x2+2x3≤2
             x1, x2≥0

5-b.   Find the optimum solution to the transportation problem given in figure for which the cost,   7
origin-availabilities, and destination-requirements are given. [CO2]

	D1	D2	D3	D4	Supply
O1	5	7	6	2	19
O2	4	3	9	1	37
O3	3	4	7	5	24
Demand	16	18	31	25	90

6. Answer any <u>one</u> of the following:-

6-a. $f(x, y) = xy^2$. Use the gradient to evaluate the path of steepest descent at (2,2). [CO4]   7

6-b.   A barber shop has two barbers and three chairs for customers. Assume that the customers   7
arrive in Poisson fashion at a rate of 5 per hour and that each barber services customers
according to an exponential distribution with mean 15 minutes. Further, if a customer
arrives and there are no empty chairs in the shop, he will leave. What is the
expected number of customers in the shop?   [CO3]

7. Answer any <u>one</u> of the following:-

7-a. Find the minimum of the function $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ using Fibonacci search 7
method in the interval (0,5). [CO4]

7-b. Explain the concept of Sub-optimization and principle of optimality with an example. [CO4] 7

8. Answer any <u>one</u> of the following:-

8-a. Compare simulated annealing and Genetic algorithm techniques of optimization. Also, name 7
the different optimization software. [CO5]

8-b. Define the terms chromosome, fitness function, crossover and mutation as used in genetic 7
algorithms. Explain how genetic algorithms work, in English or in pseudocode. [CO5]