

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Theory Examination, April 2024

B. Tech. (CSE), Semester IV

Roll No.....

AS1113: Optimization for Computer Science

Time: 3 hours

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Use of non-programmable scientific calculator is allowed.
3. Be Neat! Be Legible!! All the Best!!!

- Q1 What is the primary difference between linear and non-linear programming? Give an example of a non-linear objective function. 1.0 (CO1)
- Q2 Explain quadratic convergence in conjugate descent method. 1.0 (CO3)
- Q3 What is the main idea behind genetic algorithms? Give an example of a problem domain where genetic algorithms are commonly applied. Write a flow chart for a simple genetic algorithm. 2.0 (CO4)
- Q4 Using the golden section search method, find two numbers whose sum is 90 and their product is as large as possible. Conduct six iterations on the interval [0,90]. 7.0 (CO3)
- Q5 Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ using steepest descent method from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$. 7.0 (CO3)
- Q6 The operations research team of a construction company has come up with the mathematical data needed for two products that the firm manufactures. It also has determined that this is a non-linear programming problem, having linear constraints and objective function that is the sum of a linear and a quadratic form. The pertinent data gathered by the team is
 $Maximize Z = 12x + 21y + 2xy - 2x^2 - 2y^2$
Subject to the constraints (i) $y \leq 8$, (ii) $x + y \leq 10$
and $x, y \geq 0$.
Find the optimal solution using KKT. 7.0 (CO1)
- Q7A Suppose there are n machines that can perform two jobs. If x number of them do the first job, then they produce goods worth $g(x) = 3x$, and if y number of them perform the second job, then they produce goods worth $h(y) = 2.5y$. Machines are subject to depreciation so that after performing the first job only $a(x) = x/3$ machine remains available and after performing the second job. $b(y) = 2y/3$ machines remain available 7.0 (CO2)

in the beginning of the second year. The process is repeated with the remaining machines. Formulate the problem and obtain the maximum total return after three years using dynamic programming and also find the optimal policy in each year.

OR

- Q7B Determine the value of x_1 , x_2 and x_3 using DPP, so as to:
- | | | |
|-------------------|---|-------|
| | $Maximize\ z = x_1 \cdot x_2 \cdot x_3$ | 7.0 |
| <i>subject to</i> | $x_1 + x_2 + x_3 = 10$ | |
| And | $x_1, x_2, x_3 \geq 0$ | (CO2) |
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- Q8 Using Genetic Algorithms Minimize $f(x) = x^2 - x - 1$ over $x \in [0, 16]$ with initial x -values $\{5, 14, 1, 6, 13, 9\}$.
- Derive two generations with one mutation in each generation.
- 8.0
(CO4)