25/5/24

DOON UNIVERSITY, DEHRADUN
End Semester Examination, 2024 Semester 2nd
Academic Year 2023-24 (Even Semester)
School of Technology Department Name: Computer Science
Programme Name: Bachelor of Technology (B. Tech)
Course Code with Title: MAG-~~151~~ 152, Optimization Techniques

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Time Allowed 2:00 Hours ***Maximum Marks: 30***

SECTION: A

(Numerical ability based)
(Time allotted: 60 minutes)

Note: Attempt any five questions. (Each question carry 3 marks).

1. Explain hyperplane? Prove that the hyperplane $H = \{X \in R^n | c^T X = b\}$ is a convex set.
2. Explain Binary Tournament Operator in Binary Genetic Algorithm? How it's play a significant role for smooth convergence?
3. Check whether the set $S = \{(x_1, x_2) \in R^2 | 4x_1 - x_2 = 1, x_1 - 3x_2 = -4\}$ is a convex set or not ?
4. Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $x_1 = \binom{0}{0}$ using Newton gradient based unconstrained optimization method.
5. Write all computational steps or pseudocode of Binary Genetic Algorithm (BGA)?
6. Explain different types of errors in classification or regression machine learning algorithms?
7. Write the computational steps of K Means Clustering Algorithm?
8. Explain the concepts of Backpropagation Learning in Artificial Neural Network?

SECTION: B

(Reasoning ability based)
(Time allotted: 30 minutes)

Note: Attempt any two Questions (Each question carry 4.5 marks).

1. How gradient descent optimizer fused with Linear Regression? Explain mathematically with in depth derivation?
2. What are the maths behind the concept of Artificial Neural Network? Explain diagrammatically?
3. Explain mathematically the significances of Selection, Crossover and mutation mechanisms in Binary GA?
4. A diet is to contain at least 4000 units of carbohydrates 500 units of fats and 300 units of proteins. Two foods A and B are available. Food A cost \$20 per unit and food B cost \$40 per unit. A unit of food A contains 10 units of carbohydrates, 20 units of fat and 15 units of

protein. A unit of food B contains 25 units of carbohydrates, 10 units of fat and 20 units of protein. Formulate the problem as a LPP so as to find the minimized costs for a diet that consists of a mixture of these two foods and also meets the minimum nutrition's requirements.

SECTION: C

(Programming ability based)
(Time allotted: 30 minutes)

Note: Attempt any one Questions (Each question carry 6 marks).

1. Draw Data Flow diagram of Hand Digit recognition model? Write source code of Hand digit recognition using artificial neural network utilizing Stochastic Gradient Optimizer (SGD) in python?
2. Write source of Binary Genetic Algorithm utilizing Rosenbrock function as an objective function?