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Total Pages : 5

316301

December, 2019
M.Tech. (CE/CN/IT/CSE) 3rd SEMESTER
Optimization Techniques (MCS-18-303)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) Define optimization problem. Explain it with physical example. (1.5)

   (b) Define the following :

   (i) Objective function.

   (ii) Feasible Region.

   (iii) Saddle point. (1.5)

(c) Discuss standard and canonical representation of an optimization problem by taking an example. (1.5)

(d) State any *three* engineering applications of optimization. (1.5)

(e) Explain & show diagrammatically the following :
Local Maxima, Global Maxima, Local Minima, Global Minima (1.5)

(f) What is graphical Optimization? What are its limitations? (1.5)

(g) What is meant by positive-semi-definite and negative-semi-definite form of Quadratic programming? (1.5)

(h) What is meant by Genotype and Phenotype representations in Genetic Programming? (1.5)

(i) Formulate the mentioned problem as LPP :

A firm manufactures two types of products A and B and sells them at a profit of Rs. 2 on type A and Rs. 3 on type B. Each product is processed on two machines X and Y. Type a requires one minute of processing time on X and two minutes of processing time on Y. Type B requires one minute on X and one minute on Y. The machine X is available for not more than 6 hours 40 minutes while machine Y is available for 10 hours during any working day. (1.5)

(j) Write similarities and differences between Genetic Optimization and Particle Swarm Optimization. (1.5)

PART - B

2. (a) Write a short note on the classification of optimization problems based on different parameters. (7.5)

(b) What is Dynamic Programming Problem? How Travelling salesperson problem can be solved using Dynamic Programming? (7.5)

3. (a) Determine the Maximum and Minimum values (if any) of the function :

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 5.$$ (5)

(b) Find the extreme points of the given multivariable function:

$$f(x, y) = x^3 + y^3 + 2x^2 + 4y^2 + 6.$$ (10)

4. (a) Solve the following LPP using Simplex method.

Maximize $Z = 3x_1 + 2x_2$

Subject to constraints:

$$x_1 + x_2 \le 4$$

$$x_1 - x_2 \le 2$$

$$x_1, \ x_2 \ge 0$$ (7.5)

(b) What is Greedy method? Solve following 0/1 Knapsack problem using Greedy approach to optimize the profit:

Weight vector = $(w1, w2, w3, w4) = (1, 2, 3, 2)$

Profit vector = $(p1, p2, p3, p4) = (10, 15, 25, 12)$

Knapsack Capacity (W) = 5   (7.5)

5. (a) What is an Assignment Problem? A company is engaged in manufacturing 5 brands (B_i) of packed snacks. It is having 5 manufacturing setups (S_j), each capable of manufacturing any of its brands, one at a time. The cost to make a brand on these setups vary according to the following table:

	S1	S2	S3	S4	S5
B1	4	6	7	5	11
B2	7	3	6	9	5
B3	8	5	4	6	9
B4	9	12	7	11	10
B5	7	5	9	8	11

Assuming 5 setups are S1, S2, S3, S4, S5 and 5 brands are B1, B2, B3, B4, B5. Find the optimum assignment of products on these setups resulting in the minimum cost.   (7.5)

(b) What is a general Quadratic programming problem? Explain the Wolfe's method to solve this kind of problem? (7.5)

6. (a) What is meant by Genetic Optimization? Explain crossover and mutation. Use genetic algorithm to solve the following 0/1 knapsack problem (Show at least one iteration). (10)

(b) Differentiate between Simplex and Dual-Simplex method. (5)

7. (a) What is the inspiration behind Ant Colony Optimization? Explain Ant Colony Optimization using suitable example. (7.5)

(b) Explain Particle Swarm Optimization along with mathematical formulation of different parameters using flowchart. (7.5)

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