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**Question Paper Code: U3904**

Ph.D. COURSE WORK EXAMINATION, , MAY 2024

Second Semester

Computer Science and Engineering

21PCS904 - OPTIMIZATION TECHNIQUES

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 20 = 100 Marks)

- 1 (a) constraint Summation ( $\sum x_i \times w_i \leq 15$ ). CO2-App (20)

Objects O	1	2	3	4	5	6	7
Profit P	10	5	15	7	6	18	3
Weight w	2	3	5	7	1	4	1

Or

- (b) Maximize  $Z = 3x_1 + 4x_2$  subject to CO2-App (20)  
 $x_1 + 2x_2 \leq 4$   
 $3x_1 + 2x_2 \leq 6$   
 $x_1, x_2 \geq 0$  by graphical method

- 2 (a) Maximize  $Z = 5x_1 + 3x_2$  CO2- App (20)  
Subject to  
 $3x_1 + 5x_2 \leq 15$   
 $5x_1 + 2x_2 \leq 10$   
 $x_1, x_2 \geq 0$  using Simplex Method.

Or

- (b) Maximise  $Z = x_1 + x_2$  subject to CO2- App (20)  
 $3x_1 + 2x_2 \leq 5$   
 $x_2 \leq 2$   
 $x_1, x_2 \geq 0$ ,  $x_1$  and  $x_2$  are integers. Solve with Gomory's cutting plane method.

- 3 (a) Sarah has a new puppy and she wants to maximize her outdoor time, so she builds a fenced in play area. She has 40 feet of fencing, and she wants to fence off a rectangular area next to her house. The house will be one side of the play area, so that side needs no fencing. In order for the puppy to have adequate space, the area has to be at least 5 feet long and 5 feet wide, What is the longest area she could have? Is there a smallest area she could have if she wants to have all 40 feet for fencing?  
CO2-App (20)
- Or
- (b) Find out the maximum area a rectangle can be bounded by the line  $y = 6$  and the parabola  $y = x^2$ .  
CO2-App (20)
- 4 (a) Explore the steps in a genetic optimization algorithm with real life problem.  
CO2- App (20)
- Or
- (b) Explore the steps how genetic algorithm can be used to solve Knapsack problem with an example.  
CO2- App (20)
- 5 (a)  $F(x) = x^2$ . Apply genetic algorithm taking an initial population of 4, applying fitness function, crossover and mutation once to find the maximum value from  $0 \leq x \leq 31$ .  
CO2-App (20)
- Or

- (b) A salesman has to cover six cities with distance chart as given below: CO2-App (20)  
 Perform one iteration of genetic algorithm with following parameters:  
 Population size of 5.  
 Single point crossover with crossover probability of 0.8.  
 Swap mutation with probability of 0.01.

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From	Mumbai	0	1930	1484	1096	991	1152
	Kolkatta	1930	0	684	1091	1211	1582
	Varanas i	1484	684	0	459	1427	884
	Jabalpu r	1096	1091	459	0	1046	808
	Vijayaw ada	991	1211	1427	1046	0	1619
	Jaipur	1152	1582	884	808	1619	0

