



UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2020

DSE2-COMPUTER SCIENCE

Full Marks: 40

ASSIGNMENT

The figures in the margin indicate full marks.

**The question paper contains DSE2A and DSE2B and DSE2C.
The candidates are required to answer any *one* from *three* courses.
Candidates should mention it clearly on the Answer Book.**

DSE2A

OPERATIONAL RESEARCH FOR COMPUTER SCIENCE

Answer any *two* questions from the following

20×2 = 40

1. A company is manufacturing two products A and B, the net profit for these products is Rs. 60 and Rs. 50 respectively. These products require working in two departments C and D. The available hours per month in these departments are 150 each. Product A requires 2 hours in department C and 3 hours in department D. Product B requires 3 hours in department C and 2 hours in department D. The production of products A and B cannot exceed 40 units each because of marketability constraints. Formulate the LP model to obtain maximum profit and solve it by Simplex method. 20

2. (a) Distinguish between basic feasible solution and optimum solution of LPP. 5
(b) Use Simplex method to solve the following linear programming problem: 15

$$\text{Maximum } z = 3x_1 + 2x_2$$

Subject to the constraints

$$-2x_1 + 3x_2 \leq 9$$

$$x_1 - 5x_2 \geq -20$$

$$x_1, x_2 \geq 0$$

3. (a) Use graphical method to solve the following Linear programming problem: 15

$$\text{Minimum } z = 2x_1 + x_2$$

Subject to the constraints

$$x_1 + x_2 \geq 1$$

$$x_1 + 2x_2 \leq 10$$

$$x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

- (b) Explain redundant constraints in graphical method of LPP. 5

4. (a) Use Two phase method to solve the following LPP: 14
 Minimize $z = x_1 + x_2$
 Subject to the constraints
 $2x_1 + x_2 \geq 4$
 $x_1 + 7x_2 \geq 7$
 $x_1, x_2 \geq 0$
- (b) Define slack, surplus and artificial variable in LPP. 6
5. (a) Solve the following LPP graphically: 15
 Minimize $z = 600x + 400y$
 Subject to
 $3x + 3y \geq 40$
 $3x + y \geq 40$
 $2x + 5y \geq 44$
 $x, y \geq 0$
- (b) What is Rank of a matrix? Give example. 5

DSE2B

COMBINATORIAL OPTIMIZATION

Write any two questions from five. Each questions consist of 20 marks 20×2 = 40

1. Maximize $f(x) = x_1 + 2x_2$ 20
 Subject to: $x_1 + 2x_2 \leq 3$
 $x_1 + x_2 \leq 2$
 $x_1 \leq 1$
 $x_1 \geq 0$
 $x_2 \geq 0$
 Solve using Simplex method.
2. Maximize $f(x) = x_1 + 2x_2 + x_3$ 20
 Subject to: $x_1 + 2x_2 + x_3 \leq 2$
 $3x_1 + x_2 + x_3 \leq 4$
 $x_1 + x_2 + 2x_3 \leq 4$
 $x_1 + x_2 + x_3 \leq 2$
 $x_1 \geq 0$
 $x_2 \geq 0$
 $x_3 \geq 0$
 Solve using Simplex method.
3. (a) Write down the differences of Local and Global Optima. 10

- (b) What is global optimal solution? 5
- (c) How do you calculate global minima? 5
4. Discuss the algorithm of Dual Simplex Problem with an example. 20
5. (a) What is the relationship between convex functions and convex sets? 7
- (b) Are all convex functions differentiable? Explain. 7
- (c) Are convex functions continuous? 6

DSE2C

NUMERICAL METHODS

Answer any *two* questions from the following 20×2 = 40

1. (a) Describe different types of errors in numerical approximations. 10
- (b) Solve the following system of linear equations using Gaussian elimination method and comment on the nature of solution. 10

$$12x_1 + 18x_2 - 5x_3 = 25$$

$$3x_1 - 5x_2 + 7x_3 = 5$$

$$9x_1 + 23x_2 - 12x_3 = 20$$

2. (a) Explain Secant method of solving non-linear equation giving illustration. 10
- (b) Answer the following: 3
- (i) Given two floating point numbers $x_1 = 0.6187 \times 10^4$ and $x_2 = 0.5306 \times 10^3$, find $x_1 - x_2$ in floating point representation. 3
- (ii) Find the product of x_1 and x_2 . 4
- (iii) Show two iterations of solving the following equation using any iterative method, assuming $x = y = 0$ as initial estimate:

$$-8x + 7y = 9$$

$$5x - 2y = -7$$

3. (a) Estimate a real root of the following non-linear equation using bisection method: 10

$$x^2 \sin(x) + e^{-x} = 3$$

- (b) Define interpolation. Find the Lagrange interpolation polynomial to fit the following data and find $f(0.6)$: 2+8

x	0.4	0.5	0.7	0.8
$f(x)$	-0.916	-0.693	-0.357	-0.223

4. (a) Answer the following: 3
- (i) What are the sources of errors? 3
- (ii) Find an interval in which the equation $4x^2 - 4x - 3 = 0$ has a root. 2
- (iii) What are the advantages of direct methods over iterative methods for solving a system of linear equations? 5
- (b) Solve the following set of equations using Gauss elimination method: 10

$$x_1 + 10x_2 + x_3 = 24$$

$$10x_1 + x_2 + x_3 = 15$$

$$x_1 + x_2 + 10x_3 = 33$$

5. Write short notes on the following: 5×4 = 20
- (a) Significant digits
- (b) Floating point representation
- (c) Rounding
- (d) Ill conditioned system.

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