'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

BCA Honours 5th Semester Examination, 2021

DSE-P2-BACHELOR OF COMPUTER APPLICATION (54)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.

The question paper contains DSE54:E1 and DSE54:E2 and DSE54:E3.

The candidates are required to answer any *one* from *three* courses.
Candidates should mention it clearly on the Answer Book.

DSE54:E1 (BCADSE4)

OPERATIONAL RESEARCH

GROUP-A

1. Answer any ***five*** questions from the following: 1×5 = 5

(a) What is feasible solution?
(b) When a solution is called unbounded solution?
(c) Why artificial variables are introduced in Big-M and two phase simplex method?
(d) Why duality is used to solve a linear programming problem?
(e) Write the mathematical formulation of a transportation problem.
(f) Define network.
(g) What is a dummy activity in network scheduling?
(h) What is assignment problem?

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15

(a) Solve the following LPP graphically.

Maximize $z = 3x_1 + 4x_2$

Subject to

$$x_1 + x_2 \le 450$$
$$2x_1 + x_2 \le 600$$
$$x_1,\ x_2 \ge 0$$

(b) Express the following LPP in standard form

Maximize $z = 2x_1 + 3x_2 + x_3$

Subject to

$$4x_1 - 3x_2 + x_3 \le 6$$
$$x_1 + 5x_2 - 7x_3 \ge -4$$
$$x_1, x_3 \ge 0,\ x_2 \text{ unrestricted in sign}$$

(c) Write down the steps to solve an LPP by Big-M method.

(d) Write the dual of the following LPP

Maximize $z = 4x_1 + 2x_2$

Subject to

$$x_1 - 2x_2 \geq 2$$
$$x_1 + 2x_2 = 8$$
$$x_1 - x_2 \leq 10$$
$$x_1 \geq 0,\ x_2 \text{ unrestricted in sign}$$

(e) What is degeneracy in LPP? How do you resolve degeneracy?

GROUP-C

3. Answer any ***two*** questions from the following: $10 \times 2 = 20$

(a) Solve the following by simplex method 10

Maximize $z = 3x_1 + 2x_2 + 5x_3$

Subject to

$$x_1 + 4x_2 \leq 420$$
$$3x_1 + 2x_3 \leq 460$$
$$x_1 + 2x_2 + x_3 \leq 430$$
$$x_1, x_2, x_3 \geq 0$$

Explain each step clearly.

(b) Find the initial solution of the following transportation problem by Vogel's approximation method. 10

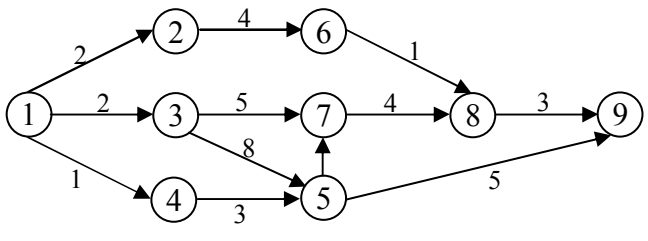
	D_1	D_2	D_3	D_4	
O_1	19	30	40	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
	5	8	7	14	

Now find the optimal solution of the problem.

(c) Solve the following assignment problem and explain each step clearly. 10

	I	II	III	IV
A	10	5	13	15
B	3	9	18	3
C	10	7	3	2
D	5	11	9	7

(d) Find the critical path and calculate the slack time of each event for the following PERT diagram. 10



DSE54:E2 (BCADSE5)

COMBINATORIAL OPTIMIZATION (TH)

1. Answer any ***five*** questions from the following: 1×5 = 5

(a) What is local optimum?

(b) What do you mean by degeneracy?

(c) What is convex set?

(d) Which method is used to solve LPP without artificial variables?

(e) What is the need of optimization techniques?

(f) What do you understand by feasible solution?

(g) What is Neighbourhood in optimization?

(h) What is LPP?

2. Answer any ***three*** questions from the following: 5×3 = 15

(a) Write short notes on Exhaustive search method.

(b) Explain Cutting Plane algorithm.

(c) Explain weak duality in LPP.

(d) Explain Dantzig-Wolfe algorithm.

(e) Explain the Branch and Bound method.

3. Answer any ***two*** questions from the following: 10×2 = 20

(a) What do you understand by global optimization in combinatorial optimization? Discuss different global optimization techniques.

(b) Write algorithm for Simplex method. Further explain the algorithm.

(c) Explain the Travelling Salesman Problem (TSP). Which approximation algorithm is suitable to solve the TSP? Justify your answer.

(d) Find solution using dual-simplex method

$$\text{Maximize } z = 2x - 9y$$

$$\text{Subject to } 5x + 7y \le 27$$
$$4x + y \le 14$$
$$3x - 2y \le 9$$
$$x, y \ge 0, x \text{ is integer.}$$

DSE54:E3 (BCADSE6)

NUMERICAL METHODS

1. Answer any ***five*** questions from the following: 1×5 = 5

(a) What do you mean by transcendental equation?

(b) What is statistical inference?

(c) When the Newton-Raphson method may fail?

(d) Write down the advantages of Modified Euler Method.

(e) What are the merits of Newton's method of iterations?

(f) Can we apply iteration method to find the root of the equation?

(g) Which of the iterative methods is used for solving linear system of equations it converges fast?

(h) On what type of equations Newton's method can be applicable?

2. Answer any ***three*** questions from the following: 5×3 = 15

(a) Find the root which lies between 1 and 2 of $f(x) = 2x^3 - 2.5x - 5 = 0$ using Newton-Raphson's method.

(b) Find a root which lies between 1 and 2 of $f(x) = x^3 + 2x^2 + 10x - 20$ using the Regula-Falsi method.

(c) Determine the root of the given equation $x^2 - 3 = 0$ using Bisection Method.

(d) A real root of the equation $f(x) = x^3 - 5x + 1 = 0$ lies in the interval (0, 1). Perform Secant Method for finding root.

(e) Distinguish the advantages of iterative methods over direct method of solving a system of linear algebraic equations.

3. Answer any ***two*** questions from the following: 10×2 = 20

(a) Solve the following system of equations using Gauss-Seidel iterative method

$$2x - y = 3$$
$$2x + 25y = 15.$$

(b) Solve the following equations using Jacobi's iteration method

$$4x - y - z = 3$$
$$-2x + 6x + z = 9$$
$$-x + y + 7z = -6$$

(c) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$.

(d) Solve the following set of equations by Gauss Elimination method:

$$x + z = 10$$
$$y + x = 0$$
$$z + y = 11$$

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