'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

BCA Honours 5th Semester Examination, 2023

DSE-P2-BACHELOR OF COMPUTER APPLICATION (54)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Answer all questions with internal choices.

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

1. Answer any ***five*** questions: 1×5 = 5

   (a) What is feasible solution?

   (b) What is a dummy activity in network scheduling?

   (c) Why duality is used to solve a linear programming problem?

   (d) What is CPM?

   (e) What are the characteristics of OR?

   (f) Define objective function.

   (g) What are the limitations of OR?

   (h) What is optimum solution?

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

   (a) Use the graphical method to solve the following LP problem:

   Maximize: $Z = x_1 + x_2$

   Subject to: $x_1 + x_2 \leq 1$

   $-3x_1 + x_2 \geq 3$

   $x_1, x_2 \geq 0$

   (b) Solve the following Transportation problem:

	1	**2**	**3**	**Capacity**
1	2	2	3	10
2	4	1	2	15
3	1	3	1	40
Demand	20	15	30	

(c) Write the dual of the following LPP.

Maximize: $Z = 4x_1 + 2x_2$

Subject to: $x_1 - 2x_2 \geq 2$

$x_1 + 2x_2 = 8$

$x_1 - x_2 \leq 10$

$x_1 \geq 0,\ x_2$ unrestricted in sign

(d) Find the optimum solution:

	1	**2**	**3**	**Capacity**
1	8	7	3	60
2	3	8	9	70
3	11	3	5	80
Demand	50	80	80	210

(e) Explain redundant constraints in graphical method of LPP.

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

(a) Solve the following LPP problem by simplex method.

Minimize: $Z = 8x_1 - 2x_2$

Subject to the constraints: $-4x_1 + 2x_2 \leq 1,$

$5x_1 - 4x_2 \leq 3$

$x_1,\ x_2 \geq 0$

(b) Solve the following assignment problem shown in Table using Hungarian method. The matrix entries are processing time of each man in hours.

	I	II	III	IV	V
1	20	15	18	20	25
2	18	20	12	14	15
3	21	23	25	27	25
4	17	18	21	23	20
5	18	18	16	19	20

(c) For the given activities determine the Critical path using PERT.

Activity	t_o	t_m	t_p
1 – 2	6	9	12
1 – 3	3	4	11
2 – 4	2	5	14
3 – 4	4	6	8
3 – 5	1	1.5	5
2 – 6	5	6	7
4 – 6	7	8	15
5 – 6	1	2	3

(d) A company has 4 machines to do 3 jobs. Each job can be assigned to one and only one machine. The cost of each job on each machine is given below. Determine the job assignments which will minimize the total cost.

$$\begin{bmatrix} 18 & 24 & 28 & 32 \\ 8 & 13 & 17 & 18 \\ 10 & 15 & 19 & 22 \end{bmatrix}$$

DSE54:E2 (BCADSE5)

COMBINATORIAL OPTIMIZATION

1. Answer any ***five*** questions: 1×5 = 5

(a) What is local optimum?

(b) Define Duality in LPP.

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

(d) What do you understand by feasible solution?

(e) What are the applications of Integer programming?

(f) What is the process to calculate global minima?

(g) Are convex functions continuous?

(h) What are convex sets?

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

(a) Explain the differences between local and global optima taking an example.

(b) What is global optimal solution? Explain.

(c) Are convex functions continuous? Justify.

(d) Discuss the cutting plan method for optimization.

(e) What is degeneracy? How can it be solved?

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

(a) Discuss the branch and bound technique to solve the travelling salesman problem with an example.

(b) Explain the Dantiz-Wolfe algorithm in detail with example.

(c) Write and explain the dual-simplex method to solve any LP problem.

(d) Use branch and bound method to solve the following problem:

Maximize: $Z = 3x_1 + 4x_2$

Subject to: $7x_1 + 16x_2 \le 52$,

$3x_1 - 2x_2 \le 18$,

$x_1,\ x_2 \ge 0$ and are integers.

DSE54:E3 (BCADSE6)

NUMERICAL METHODS

1. Answer any ***five*** questions: 1×5 = 5

(a) How many significant digits does the floating point number 0.0759×10^5 have?

(b) What do you mean by transcendental equation?

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

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

(e) Define absolute error.

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

(g) What is the sufficient condition for Gauss-Seidel method to converge?

(h) Define truncation error. Give example.

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

(a) Write the step by step description of Regula-Falsi method.

(b) Evaluate $\sqrt{19}$ using Newton-Raphson's formula.

(c) Estimate a real root of the following non-linear equation using bisection method:
$x^2\sin(x)+e^{-x}=3$.

(d) Find the roots of the equation: $x^2+5.6x-10=0$ by trial and error up to 4 significant digits.

(e) Write short notes on Floating point representation.

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

(a) Solve the system of equations using Gauss-Seidel iterative methods.
$x+10y+z=24$, $10x+y+z=15$, $x+y+10z=33$.

(b) Use the Runge-Kutta method with $h=0.1$ to find approximate values for the solution of the initial value problem: $y'+2y=x^3e^{-2x}$, $y(0)=1$, at $x=0.1,\ 0.2$.

(c) Evaluate $\int_0^1 (x^3+1)dx$ using Trapezoidal rule.

(d) Find the real root of the equation $3x-\cos(x)-1=0$ by regula falsi method correct up to four significant figures.

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