UNIVERSITY OF NORTH BENGAL

BBA Honours 3rd Semester Examination, 2022

GE3-BBA (304)

QUANTITATIVE TECHNIQUES FOR MANAGEMENT

Time Allotted: 2 Hours   Full Marks: 60

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

GROUP-A

Answer any *two* questions from the following $12 \times 2 = 24$

1. Solve the following LPP using simplex method.   12

    Max $Z = 15x_1 + 6x_2 + 9x_3 + 2x_4$

    Subject to, $2x_1 + x_2 + 5x_3 + 6x_4 \leq 20$

    $\qquad 3x_1 + x_2 + 3x_3 + 24x_4 \leq 24$

    $\qquad 7x_1 + x_4 \leq 70$

    $\qquad x_1, x_2, x_3, x_4 \geq 0$

2. Determine an initial basic feasible solution for the following Transportation problem, using the Least cost method. Also, test the optimality of the obtained solution.   6+6

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	35

3. A small maintenance project consists of the following jobs, whose precedence relationships are given below: 2+8+2

Job	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration(days)	15	15	3	5	8	12	1	14	3	14

    (a) Draw the network diagram representing the project.

    (b) Find the total float for each activity.

    (c) Find the critical path and the total project duration.

4. (a) The probability distribution of monthly sales of an item is as follows: 7+5

Monthly sales (units)	0	1	2	3	4	5	6
Probabilities	.01	.06	.25	.30	.22	.10	.06

The cost of carrying inventory (unsold during the month) is Rs. 30 per unit per month and the cost of unit shortage is Rs. 70. You are required to determine the optimum stock to minimize expected cost and also calculate the EVPI.

(b) Explain Saddle Point with a suitable example.

GROUP-B

5.   Answer any *four* questions: 6×4 = 24

(a) Use graphical method to solve the following LPP.   6

Minimize $Z = 20x_1 + 10x_2$

Subject to, $x_1 + 2x_2 \leq 40$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60$$

$$x_1, x_2 \geq 0$$

(b) A company has 5 jobs to be done on five machines. Any job can be done on any machine. The cost of doing the jobs on different machines are given below. Assign the jobs for different machines so as to minimize the total cost.   6

Jobs	Machines				
	A	B	C	D	E
1	13	8	16	18	19
2	9	15	24	9	12
3	12	9	4	4	4
4	6	12	10	8	13
5	15	17	18	12	20

(c) A project has the following activities and characteristics: 3+3

Activity	Estimated duration in days		
	Optimistic	*Most Likely*	*Pessimistic*
1-2	2	5	8
1-3	4	10	16
1-4	1	7	13
2-5	5	8	11
3-5	2	8	14
4-5	6	9	12
4-6	4	7	10

You are required to find the expected duration of each activity and their variances.

(d) What are the different types of games? Differentiate between pure strategy and mixed strategy. — 4+2

(e) Explain the terms: (i) Optimal basic Feasible solution, (ii) Unbounded solution, (iii) Degenerate solution — 2+2+2

(f) Write a note on Monte Carlo Simulation technique and its applicability. — 6

GROUP-C

6.   Answer any *four* questions: — $3 \times 4 = 12$

(a) Write the dual of the following primal LPP. — 3

   Max $Z = x_1 + 2x_2 + x_3$

   Subject to, $2x_1 + x_2 - x_3 \leq 2$

   $-2x_1 + x_2 - 5x_3 \geq -6$

   $4x_1 + x_2 + x_3 \leq 6$

   $x_1, x_2, x_3 \geq 0$

(b) Briefly discuss Sensitivity Analysis. — 3

(c) Suppose we are landed on a treasure island full of three types of valuable stones, emerald (E), ruby (R) and topaz (T). Each piece of E, R, and T weighs 3, 2, 2 kg and has a value of 4, 3, 1, crore respectively. We have a bag that can carry a maximum of 11 kg. The stones cannot be made into smaller pieces. Formulate this situation as an IPP so as to maximize the total value carried. — 3

(d) Distinguish between PERT and CPM. — 3

(e) Determine the initial basic feasible solution to the following transportation problem using the North-West corner method.

	D_1	D_2	D_3	D_4	SUPPLY
S_1	2	3	11	7	6
S_2	1	0	6	1	1
S_3	5	8	15	9	10
DEMAND	7	5	3	2	

(f) Explain the Dominance Property of reducing the size of the game.

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