



‘समानो मन्त्रः समितिः समानी’

**UNIVERSITY OF NORTH BENGAL**

BBA Honours 3rd Semester Examination, 2023

**GE3-BBA (304)****QUANTITATIVE TECHNIQUES FOR MANAGEMENT**

Time Allotted: 2 Hours

Full Marks: 60

*The figures in the margin indicate full marks.***GROUP-A****Answer any two questions from the following**

12×2 = 24

1. Solve the following LPP using Simplex method:

12

Maximize  $Z = 12x + 5y$

Subject to,  $5x + 3y \leq 45$

$2x + 3y \leq 36$

$4x \leq 24$

Given,  $x \geq 0, y \geq 0$

2. Consider the time duration of activities of a project given in terms of days:

3+3+3+3

Activity	Predecessor	$t_0$	$t_m$	$t_p$
A	-	5	7	9
B	-	4	10	16
C	A, B	6	7	11
D	B	4	6	8
E	C	4	7	7
F	C, D	3	5	7
G	E, F	5	6	7

You are required to find:

- (a) The Project Network.  
 (b) All expected activity time, variance and slacks.  
 (c) The Critical path and expected completion time.  
 (d) The Probability that project will be completed in 27 days.

3. (a) The demand for a seasonal product is as given below:

6+6

Demand	21	22	23	24	25	26	27	28
Probability	0.07	0.08	0.10	0.11	0.29	0.20	0.09	0.06

The product costs Rs. 200 per unit and sells at Rs. 300 per unit. If the units are not sold within the season, they will fetch a salvage value of Rs. 50. You are required to determine the optimum number of units to be produced and calculate the EVPI.

(b) “Dual of the dual is a Primal.” — Explain with an example.

4. Determine an initial basic feasible solution for the following Transportation problem, using the Vogel’s Approximation Method (VAM). Also, test the optimality of the obtained solution: 12

		<b>Destination</b>				
		P	Q	R	S	Supply
<b>Source</b>	A	11	13	17	14	250
	B	16	18	14	10	300
	C	21	24	13	10	400
	Demand	200	225	275	250	950

**GROUP-B**

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

- (a) A company has 5 jobs to be done on five machines. Assign the jobs for different machines so as to minimize the total cost: 6

		<b>Machines</b>			
		M	N	O	P
<b>Jobs</b>	A	6	12	7	15
	B	11	8	11	7
	C	16	14	15	12
	D	9	9	11	6

- (b) Solve the following LPP using graphical method: 6

Minimize  $C = 6x + 10y$

Subject to,  $10x + 4y \geq 220$

$5x + 5y \geq 200$

$2x + 6y \geq 120$

Given,  $x \geq 0, y \geq 0$

- (c) Write a short note on the different applications of LPP in business management. 6

- (d) Minimize  $Z = 14x_1 + 22x_2$  6

Subject to,  $6x_1 + 8x_2 \geq 100$

$7x_1 + 12x_2 \geq 120$

$x_1, x_2 \geq 0$

- (e) Write short notes on: 3+3

- (i) Mixed Strategy
- (ii) Nash Equilibrium.

(f) For the game with pay-off matrix:

4+2

		Player B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Player A	A <sub>1</sub>	19	14	11	35
	A <sub>2</sub>	24	13	7	10
	A <sub>3</sub>	36	2	9	5
	A <sub>4</sub>	-5	4	11	0

Determine the optimal strategies for Players A and B. Also determine the value of the game.

**GROUP-C**

6. Answer any **four** questions from the following: 3×4 = 12
- (a) How does the problem of degeneracy arise in a transportation problem? 3
  - (b) What do you mean by unbounded solution of an LPP? 3
  - (c) What do you understand by: 3
    - (i) Free float, (ii) Critical activity, and (iii) Slack variables?
  - (d) Discuss the advantages of using simulation for solving management problems. 3
  - (e) Obtain the dual of the following primal LPP problem: 3

Minimize  $Z = 3x_1 - 2x_2 + 4x_3$

Subject to,  $3x_1 + 5x_2 + 4x_3 \geq 7$

$6x_1 + x_2 + 3x_3 \geq 4$

$7x_1 - 2x_2 - x_3 \leq 10$

$x_1 - 2x_2 + 5x_3 \geq 3$

$4x_1 + 7x_2 - 2x_3 \geq 2$

and,  $x_1, x_2, x_3 \geq 0$

- (f) Distinguish between PERT and CPM. 3

—x—