	UNIVERSITY OF RUHUNA **FACULTY OF MANAGEMENT AND FINANCE**	No. of Pages : 04 No of Questions: 05 Total Marks : 70
BACHELOR OF BUSINESS ADMINISTRATION HONOURS DEGREE		*Three Hours*
2000 LEVEL FIRST SEMESTER END EXAMINATION – AUG/SEP 2025		
BBA 21043 – OPERATIONS RESEARCH		**Academic Year 2024/2025**

Instructions:

- Answer all questions.
- Non programmable calculators are allowed.

Question 01

I. Furniture Manufacturing Company produces tables and chairs with profit of Rs. 500 per table and Rs. 1000 per chair. The company can sell a maximum of 400 tables each month. Although the exact demand for chairs is uncertain, the company must sell at least 50 chairs each month to satisfy their regular customers. The company has a machine that can be operated for up to 500 hours per month. Each table requires 6 machine hours, and each chair requires 4 machine hours. Total available labor is limited to 600 hours a month. Producing a table requires 6 labor hours, and producing a chair requires 8 labor hours. Raw material stock is sufficient for only 60 units (tables and chairs combined) per month, one unit of raw material is required per item.

Develop a linear programming model based on the given information.

(08 marks)

II. Briefly explain the importance of operations research techniques in decision making.

(04 marks)

III. Write down four (4) types of limitations in operations research techniques.

(02 marks)

(Total 14 marks)

Question 02

I. What types of linear programming problems are best suited for the graphical method versus the simplex method?

(02 marks)

II. Find the optimal production quantities for Pens and Pencils based on the following linear programming model using the Simplex method.

X1; Number of pens produced

X2; Number of pencils produced

Maximize $Z = 40X1 + 50X2$

Subject to,

$3X1 + 3X2$	≤ 90	Process I
$2X1 + 4X2$	≤ 80	Process II
X1, X2	≥ 0	Non-negativity

(12 marks)

(Total 14 marks)

Question 03

Delta enterprise operates three distribution centers, D1, D2 and D3, which supply products to its three clients, M, N, and O. The supply capacities, client demands, and shipping costs are provided in the table below.

Distribution Centers	Clients			Supply
	M	**N**	**O**	
D1	20	9	5	300
D2	6	10	18	200
D3	2	15	12	500
Demand	400	240	360	

You are required to,

I. Find an initial feasible solution using the North West Corner Method for the given transportation problem and compute its total transportation cost.

(04 marks)

II. Find the optimal solution to minimize transportation costs by using the Stepping Stone Method.

(10 marks)

(Total 14 marks)

Question 04

Ananda Holdings plans to invest Rs. 10 million in purchasing machines to maximize profitability through a diversified investment strategy. The company is open to investing in one or several machines, depending on the available capital. The table below shows the alternative investment options along with their expected cost and returns.

Alternative investment option	**Machine 1**		**Machine 2**		**Machine 3**	
	Cost	Return	Cost	Return	Cost	Return
1	0	0	0	0	0	0
2	2	30	4	20	2	6
3	4	36	6	30	4	14
4	8	56	8	35	-	-

You are required to,

I. Draw a diagram for this using the Dynamic Programming Technique.

(12 marks)

II. Find the suitable investment option/s for the company using the diagram.

(02 marks)

(Total 14 marks)

Question 05

I. Priyantha has Rs. 150,000 to invest and wants to identify the best investment option that maximizes expected returns. After analyzing available opportunities, Priyantha has shortlisted three alternatives:

a) Investing in the stock market

b) Purchasing rental property

c) Depositing in a fixed deposit account

The table below provides the payoff (in rupees) for each investment under three economic conditions: boom, stable and recession.

Investment Option	**Boom (Best)**	**Stable**	**Recession (Worst)**
Investing in the stock market	15,000	7,500	-3,000
Purchasing rental property	6,000	6,000	6,000
Fixed deposit account	9,000	7,000	2,500

Assuming you are operating under uncertainty, apply Hurwicz's criterion to determine the best investment choice for Priyantha. Use an optimism coefficient (α) of 0.7 to weigh the payoffs.

(04 marks)

II. Sunpeak Construction Ltd. is managing a critical infrastructure project named "Greenfield Highway Development." The project involves several interconnected activities, each with a specific duration, which must be carefully scheduled to ensure timely completion.
The following information related to a construction project.

Activity	Immediate predecessor	Time (Months)
A	-	4
B	-	5
C	A	2
D	A	6
E	B, C	3
F	B, C	3
G	D, E	5
H	G, F	3

a) Develop a network diagram for the project.

(08 marks)

b) Identify the critical path and calculate the total time required to complete the project.

(02 marks)

(Total 14 marks)

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