



**UNIVERSITY OF RUHUNA**  
**FACULTY OF MANAGEMENT AND FINANCE**

No. of Pages : 04  
No. of Questions: 05  
Total Marks : 70

**BBA 2104 – Operations Research**

Academic Year 2022/2023

BACHELOR OF BUSINESS ADMINISTRATION HONOURS DEGREE

*Three Hours*

2000 LEVEL FIRST SEMESTER END EXAMINATION – AUGUST/  
SEPTEMBER 2023 (OLD SYLLABUS)

**Instructions**

- ➡ Answer all questions.

**Question 01**

- I. Write down four (4) types of limitations in operations research techniques. (02 marks)
  - II. Briefly explain the importance of studying operations research. (05 marks)
  - III. ABC (Pvt) Ltd. sells tables and chairs, earning a profit of Rs. 500.00 per chair and Rs. 750.00 per table, respectively. Both products are produced using a common production process but are sold in two different marketplaces. To produce one unit of a chair and a table, it takes 3 hours and 1 hour respectively. 65,000 hours of labor capacity are available for the company. According to a survey, they have observed that 10,000 and 8,000 units are possible to be sold from chairs and tables respectively.  
Develop a linear programming model based on the given information to maximize the profit of the company. (07 marks)
- (Total 14 marks)**

**Question 02**

A company manufactures two products, **P** and **Q**, with anticipated profits of Rs. 80.00 and Rs. 180.00 per unit respectively. Producing one unit of **P** requires four (04) labor hours, while **Q** requires two (02) labor hours. The manager decides to utilize the entire eighty (80) labor hours capacity for the production. **P** uses one (01) unit of materials, and **Q** requires three (03) units of materials. The daily material capacity is limited to sixty (60) units.

You are required to,

- I. Solve the above problem using the linear programming simplex method. (12 marks)
  - II. How many units of **P** and **Q** should be produced to maximize the profit? (02 marks)
- (Total 14 marks)**

**Question 03**

ABC Company is following a diversified investment policy to maximize profitability. The company is planning to invest Rs. 5 million in one or several projects. The number of projects depends on the company's capital availability. The following table shows the alternative investment options and expected returns.

Alternative option	Project 1		Project 2		Project 3	
	Cost	Return	Cost	Return	Cost	Return
1	0	0	0	0	0	0
2	2	10	2	12	1	3
3	3	15	3	18	2	6
4	4	28	4	20	-	-

You are required to,

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

(12 marks)

- II. Find the suitable investment option for the company using the diagram.

(02 marks)

**(Total 14 marks)**

**Question 04**

- I. What is an unbalanced transportation problem? Briefly explain with an example.

(03 marks)

- II. A company has factories at F1, F2, and F3 that supply products to three distribution centres named A, B and C. The weekly capacities of the factories, the requirements of distribution centres, and the unit shipping costs (in rupees) are as follows:

Factories	Distribution centers			Supply
	A	B	C	
F1	5	4	3	250
F2	8	4	3	300
F3	9	7	5	300
<b>Demand</b>	<b>300</b>	<b>200</b>	<b>200</b>	

You are required to,

- I. Find the initial feasible solution using the North West Corner method. (04 marks)
- II. Calculate the transportation cost of the initial feasible solution. (01 marks)
- III. Find the optimal solution to minimize transportation costs using the Modified Distribution (MODI) method. (06 marks)

**(Total 14 marks)**

**Question 05**

- I. What are the objectives of the network analysis? (02 marks)
- II. The following table presents project activities, their immediate predecessor(s), and the corresponding duration in days.

Activity	Preceding activity	Activity duration in days
A	-	20
B	-	10
C	A	8
D	B	11
E	A	7
F	C, D	6
G	D	12
H	E	5
I	F, G, H	2

You are required to,

- a) Construct the project network diagram for the project. (05 marks)
- b) Compute the total floats of each activity. (03 marks)
- c) Find the critical path and project completion time. (02 marks)

III. Compute the expected time for each activity using the following time estimates.

Activity	Optimistic time estimate ( $t_o$ days)	Most likely time estimate ( $t_m$ days)	Pessimistic time estimate ( $t_p$ days)
A	2	5	8
B	2	3	4
C	6	8	10
D	2	4	6

(02 marks)

**(Total marks 14)**

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