



UNIVERSITY OF RUHUNA
FACULTY OF MANAGEMENT AND FINANCE

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

BBA 21043 - Operations Research

Academic Year 2022/2023

BACHELOR OF BUSINESS ADMINISTRATION HONOURS DEGREE

Three Hours

2000 LEVEL FIRST SEMESTER END EXAMINATION -
AUGUST/SEPTEMBER 2023

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. Browns Furniture (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) hours labor 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
Demand	300	200	200	



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)
