

Roll No.

Total No. of Pages : 04

Total No. of Questions : 17

MBA (Sem.-3)

OPERATION RESEARCH APPLICATIONS

Subject Code : MBA-952-18

M.Code : 77056

Date of Examination : 14-12-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A** contains **EIGHT** questions carrying **TWO** marks each and students has to attempt **ALL** questions.
2. **SECTION-B** consists of **FOUR** Subsections : Units-I, II, III & IV. Each Subsection contains **TWO** questions each carrying **EIGHT** marks each and student has to attempt any **ONE** question from each Subsection.
3. **SECTION-C** is **COMPULSORY** and consist of **ONE** Case Study carrying **TWELVE** marks.

SECTION-A

Write briefly :

1. Briefly explain the characteristics of Operations Research.
2. What is a Decision and what are its characteristics.
3. Define Artificial Variables.
4. Function of Surplus in simplex procedure.
5. Explain Queuing Theory.
6. Explain the concept of time and cost function.
7. Merits and Demerits of Networks Models.
8. List the types of non-linear programming problems.

SECTION-B

UNIT-I

9. Enumerate and explain the steps involved in building up various types of mathematical models for decision making in business and industry.
10. What is Operations Research model? Discuss the advantages and limitation of good Operations Research model.

UNIT-II

11. A factory manufactures two products A and B on three machines X, Y and Z. Product A requires 10 hours of machine X and 5 hours of machine Y and one hour of machine Z. The requirement of product B is 6 hours, 10 hours and 2 hours of machine X, Y and Z respectively. The profit contribution of products A and B are Rs. 23/- per unit and Rs. 32 /- per unit respectively. In the coming planning period the available capacity of machines X, Y and Z are 2500 hours, 2000 hours and 500 hours respectively. Find the optimal product mix for maximizing the profit.
12. Define and explain the significance of Slack variable, Surplus variable, Artificial variable in linear programming resource allocation model.

UNIT-III

13. In a cargo-loading problem, there are four items of different per unit weight and value as given below. The minimum cargo load is restricted to 10 units. How many units of each item are loaded to maximize the value?

Item	Weight w_i	Value per unit v_i
1	2	2
2	3	5
3	4	7
5	5	9

14. A company has three production facilities S1, S2 and S3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D1, D2, D3 and D4 with requirement of 5, 6, 7 and 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below :

	Warehouse				Supply (Availability)
	D ₁	D ₂	D ₃	D ₄	
S ₁	19	30	50	10	7
S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Demand (Requirement)	5	8	7	14	34

Use Vogel's Approximation Method (VAM) to find an initial basic feasible solution to the transportation problem.

UNIT-IV

15. Give the graphical illustration to non-linear programming problems.
16. The following table gives the activities of a construction project and duration.

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration	20	25	10	12	5	10

- a) Draw the network for the project
- b) Find the critical path.

SECTION-C

17. A small project is composed of 7 activities whose time estimates are listed below. Activities are being identified by their beginning (i) and ending (j) node numbers.

Activities		Time in weeks		
<i>i</i>	<i>j</i>	<i>t_o</i>	<i>t_p</i>	<i>t_p</i>
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

- a. Draw the network.
- b. Calculate the expected variances for each.
- c. Find the expected project completion time.
- d. Calculate the probability that the project will be completed at least 3 weeks than expected.
- e. If the project due date is 18 weeks, what is the probability of not meeting the due date?

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.