

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V EXAMINATION – SUMMER 2025****Subject Code:3152008****Date:15-05-2025****Subject Name:Production Optimization Techniques****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Marks

- Q.1**
- (a) Why Transportation is a special case of Linear Programming? **03**
- (b) What is the modern approach to management? What are the four major approaches to the study of management? **04**
- (c) A Company has 3 production facilities S1, S2 and S3 with production capacity of 7, 9 and 18 units (in 100's) per week of a product, respectively. These units are to be shipped to 4 warehouses D1, D2, D3 and D4 with requirement of 5,8,7 and 14 units (in 100's) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below. **07**

	D1	D2	D3	D4	Capacity
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

Find initial basic feasible solution for given problem by using Vogel's approximation method .

- Q.2**
- (a) Explain feasible solution? **03**
- (b) Explain Infeasibility and Unboundedness for a LPP using Graphical Method. **04**
- (c) Find solution using graphical simplex method. **07**

Maximize $Z = -2x_1 - x_2$
 subject to the constraints
 $-3x_1 - x_2 \leq -3$
 $-4x_1 - 3x_2 \leq -6$
 $-x_1 - 2x_2 \leq -3$
 and $x_1, x_2 \geq 0$

OR

- (c) Find solution using simplex method. **07**
- Maximize $Z = 3x_1 + 5x_2 + 4x_3$
 subject to the constraints
 $2x_1 + 3x_2 \leq 8$
 $2x_2 + 5x_3 \leq 10$
 $3x_1 + 2x_2 + 4x_3 \leq 15$
 and $x_1, x_2, x_3 \geq 0$

- Q.3** (a) What is 'restriction' on allocation? **03**
 (b) What is degeneracy in transportation problem? How should it be treated? **04**
 (c) A department has five employees with five jobs to be performed. The time (in hours) each men will take to perform each job is given in the effectiveness matrix. **07**

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

OR

- Q.3** (a) What is the optimality criterion in the assignment problem? **03**
 (b) What do you understand by opportunity cost? **04**
 (c) Obtain an optimal solution by MODI method for the case mentioned in Question 1- C, if the object is to minimize the total transportation cost. **07**

- Q.4** (a) Explain decision making under certainty. **03**
 (b) Describe special case of assignment problem- 'Transshipment' in detail with example. **04**
 (c) Write a brief note on decision making under certainty. **07**

OR

- Q.4** (a) Define float and critical activity. **03**
 (b) Differentiate between (i) Earliest starting time (EST) & Latest starting time (LST) (ii) Earliest finishing time (EFT) & Latest finishing time **04**
 (c) An established company has decided to add a new product to its line. It will buy the product from a manufacturing concern, package it, and sell it to a number of distributors that have been selected on a geographical basis. Market research has already indicated the volume expected and the size of sales force required. The steps shown in the following table are to be planned. **07**

Activity	Description	Predecessor Activity	Duration (days)
A	Organize sales office	-	6
B	Hire salesman	A	4
C	Train salesman	B	7
D	Select advertising agency	A	2
E	Plan advertising campaign	D	4

F	Conduct advertising campaign	E	10
G	Design package	-	2
H	Setup packaging campaign	G	10
I	Package initial stocks	J,H	6
J	Order stock from manufacturer	-	13
K	Select distributors	A	9
L	Sell to distributors	C,K	3
M	Ship stocks to distributors	I,L	5

- (a) Draw an arrow diagram for the project.
(b) Indicate the critical path.

- Q.5** (a) Mention different types of sequencing problem. **03**
(b) Explain crashing of project. **04**
(c) There are seven jobs, each of which has to be processed on machine A and then on Machine B (order of machining is AB). Processing time is given in hours. Find the optimal sequence in which the jobs are to be processed so as to minimize the total time elapsed. **07**

JOB:	1	2	3	4	5	6	7
Machine: A:(time in hours).	3	12	15	6	10	11	9
Machine: B:(time in hours).	8	10	10	6	12	1	3

OR

- Q.5** (a) What is a decision? Explain programmed decision. **03**
(b) Explain any two rules for priority. **04**
(c) Explain the conditions required to satisfy when you want to convert a 3-machine problem into 2- machine problem. **07**
