

R22

Code No: 782AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA II Semester Examinations, February/March - 2025

QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS

Time: 3 Hours

Max.Marks:60

Note: This question paper contains two parts A and B.

i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. Each of these questions is from each unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

PART – A

(10 Marks)

- 1.a) What are the limitations of OR? [1]
- b) Write the scope of operations research. [1]
- c) Convert the RHS of the inequality constraint $x_1 - 3x_2 + 5x_3 - 2x_4 \geq -15$ to positive. [1]
- d) What is dual LPP? [1]
- e) What is meant by an optimality test in a transportation problem? [1]
- f) Give the mathematical formulation of an assignment problem. [1]
- g) Mention any one difference between CPM and PERT. [1]
- h) Explain the concept of “decision making under risk”. [1]
- i) Write the limitations of dominance method in game theory. [1]
- j) What is jockeying? [1]

PART – B

(50 Marks)

- 2.a) “The purpose of operations research is to achieve the best performance under the given circumstances.” discuss. [5+5]
- b) Illustrate the applications of OR in different business areas. [5+5]

OR

3. Explain the Process for Developing an Operations Research Model and brief on types of model with suitable example. [10]

4. Obtain the dual of the LPP given below: [10]

$$\begin{aligned} &\text{Maximize} && Z = 8X_1 + 12X_2 + 6X_3 \\ &\text{Subject to} && X_1 - X_2 \leq 5 \\ &&& 2X_1 + 4X_2 \leq 12 \\ &&& X_1 + X_2 + X_3 \geq 2 \\ &&& 3X_1 + 2X_2 - X_3 = 7 \\ &&& X_1, X_2, X_3 \geq 0 \end{aligned}$$

OR

QA QA QA QA QA QA QA QA QA

- 5.a) What are the assumptions of LPP?
b) Formulate the dual of the following primal problem: [5+5]

$$\begin{aligned} &\text{Maximize} && Z = 100x_1 + 70x_2 + 30x_3 \\ &\text{Subject to} && 20x_1 + 10x_2 + 5x_3 \leq 1000 \\ &&& x_1 + x_2 + x_3 \leq 50 \\ &&& x_1, x_2, x_3 \geq 0 \end{aligned}$$

6. The owner of small machine shop has four machines available to assign to jobs for the day. Five jobs are offered with expected profit for each machinist on each job as follows:

	A	B	C	D	E
1	62	78	50	101	82
2	71	84	61	73	59
3	87	92	111	71	81
4	48	64	87	77	80

Find the assignment of machinists to jobs that will result in a maximum profit. Which job should be declined? [10]

OR

7. Solve the following transportation problem by using VAM method. [10]

Origin/Destination	D1	D2	D3	D4	Supply
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
Demand	200	225	275	250	950

8. A large steel manufacturing company has three options with regard to production: (a) produce commercially (b) build pilot plant and (c) stop producing steel.

The management has estimated that their pilot plant, if built, has 80% chances of high yield 20% chances of low yield. If pilot plant does show a high yield, management assigns a probability of 0.75 that the commercial plant will also have a high yield. If pilot plant shows a low yield, there is only a 0.1 chance that the commercial plant will show a high yield. Finally management's best assignment of the yield on a commercial size plant without building a pilot plant first has a 0.6 chance of high yield. A pilot plant will cost Rs. 3,00,000. The profits earned under high and low yield conditions are Rs. 1,20,00,000 and Rs 12,00,000 respectively.

Find the optimum decision of the company. [10]

OR

QA QA QA QA QA QA QA QA QA

9. A project has the following characteristics

Activity	Most optimistic time (a)	Most pessimistic time (b)	Most likely time (m)
1-2	1	5	1.5
2-3	1	3	2
2-4	1	5	3
3-5	3	5	4
4-5	2	4	3
4-6	3	7	5
5-7	4	6	5
6-7	6	8	7
7-8	2	6	4
7-9	5	8	6
8-10	1	3	2
9-10	3	7	5

Construct a PERT network. Find the critical path and variance for each event. [10]

10. At what average rate a clerk at a supermarket work in order to ensure a probability of 0.90 that the customer will not have to wait longer than 12 minutes? It is assumed that there is only one counter to which customers arrive in a Poisson fashion at an average rate of 15 per hour. The length of service by the clerk has an exponential distribution?

[10]

OR

11. Two firms are competing for business under the condition so that one firm's gain is another firm's loss. Firm A's payoff matrix is given below:

		Firm B		
		No Advertising	Medium Advertising	Heavy Advertising
Firm A	No Advertising	10	5	-2
	Medium Advertising	13	12	15
	Heavy Advertising	16	14	10

Suggest optimum strategies for the two firms and the net outcome thereof. [10]

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