Code No: 782AD

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MBA II Semester Examinations, February/March - 2024
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**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from **Part-B.**

PART- A

(10 Marks)

1.a) Is OR suited to help in decision making as to the need for opening another counter in a bank? [1]
b) What is the nature of decision variable? [1]
c) What is the conclusion you draw if two constraints do not intersect on the positive quadrant? [1]
d) Does primal have a solution if the dual has an unbounded solution? [1]
e) Why do we add dummy source or destination in transportation problem? [1]
f) What is the name used for the method of solving the assignment problem? [1]
g) What is EVPI? [1]
h) Define cost slope. [1]
i) When is calling population considered to be infinite? [1]
j) Define saddle point. [1]

PART-B

(50 Marks)

2.a) What are the different types of models used in OR?
b) What is the approach to problem solving in OR? [5+5]

OR

3.a) Briefly explain the interdisciplinary approach of operations research.
b) What is the role of OR in management decision making? [5+5]

4. Vitamins A and B are found in foods F_1 and F_2 .One unit of F_1 contains three units of Vitamin A and four units of Vitamin B. One unit of food F_2 contains six units of Vitamin A and three units of Vitamin B. One unit of food F_1 and F_2 cost Rs. 4 and Rs.5 respectively. The minimum daily requirement for a person of Vitamin A and B is 80 and 100 units respectively. Assuming that anything in excess of the daily minimum requirement of A and B is not harmful.
Formulate the problems as an LP model to find out the optimum mixture of Food F_1 and F_2 at the minimum cost which meets the daily minimum requirement of Vitamin A and B. [10]

OR

5. One unit of product A contributes Rs.7 and requires 3 units of raw material and 2 hours of labor. One unit of product B contributes Rs.5 and requires one unit of raw material and one hour of labor. Availability of raw material at present is 48 units and there are 40 hours of labor.
a) formulate the problem at LP problem.
b) write its dual.
c) solve the dual b the simplex method and find the optimal product mix and the shadow prices of the raw material and the labor. [3+3+4]

6. A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimates of the times that each man would take to perform each task is given below in the matrix:

	Tasks I	II	III	IV
Subordinates A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated to subordinates so as to minimize the total hours? [10]

OR

7. Consider the transportation problem having the following cost and requirements table.

	Destination				
	D	E	F	G	Supply
Source A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
demand	200	225	275	250	

solve it for optimum transportation schedule and cost. [10]

8. The demand pattern of cup cakes made in a bakery is as follows:

No. of cakes demanded	0	1	2	3	4	5
Probability	0.05	0.1	0.25	0.3	0.20	0.1

If the preparation cost is Rs.30 per unit and the selling price is Rs.40 per unit how many cakes should the baker make to maximize his profit? [10]

OR

9. Consider the following project with activity sequence and the duration defined as below:

activity	predecessors	Duration in weeks (optimistic)	Duration in weeks (most likely)	Duration in weeks (pessimistic)
A	---	3	5	8
B	---	6	7	9
C	A	4	5	9
D	B	3	5	8
E	A	4	6	9
F	C,D	5	8	11
G	C,D,E	3	6	9
H	F	1	2	9

a) Construct the project network.
b) Find the expected duration and variance of each activity.
c) Find the critical path and expected project completion time. [3+4+3]

10. There is 40% chance that a patient admitted to the hospital is suffering from cancer. A doctor has to decide whether a serious operation should be performed or not. If the patient is suffering from cancer and the serious operation is performed, the chance that he will recover is 70%. Otherwise, it is 35%. On the other hand, if the patient is not suffering from cancer and the serious operation is performed, the chance he will recover is 20%, otherwise it is 100%. Assume that recovery and death are the only possible results. Construct an appropriate decision tree. What decision should the doctor take? [10]

OR

11. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to hump the train) distribution is also exponential with an average of 36 minutes. Calculate :
a) Expected queue size (line length).
b) Probability that the queue size exceeds 10.
c) If the input of trains increases to an average of 33 per day, what will the change in a and b? [3+3+4]

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