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20MBA24

Second Semester MBA Degree Examination, July/August 2022
Operations Research

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FOUR full questions from Q1 to Q7.**
2. Question No. 8 is compulsory.
3. Use of Normal Distribution Table is permitted.

- 1 a. Define operation research. (03 Marks)
b. Discuss the applications of operations research. (07 Marks)
c. Use the graphical method to solve the following LP problem
Maximize $Z = 15x_1 + 10x_2$
Subject to the constraints $4x_1 + 6x_2 \leq 360$
 $3x_1 + 0x_2 \leq 180$
 $0x_1 + 5x_2 \leq 200$
and $x_1, x_2 \geq 0$ (10 Marks)

- 2 a. What is a basic feasible solution? Mention the type of basic feasible solution. (03 Marks)
b. A computer centre has three expert programmes. The centre want three application programmes to be developed. The head of the computer centre, after studying carefully the programmes to be developed, estimates the computer time in minutes required by the experts for the applications programmes as follows :

		Programmers		
		A	B	C
Programmes	1	120	100	80
	2	80	90	110
	3	110	140	120

- Assign the programmers to the programmes in a such a way that the total computer time is minimum. (07 Marks)
c. Briefly discuss the operations research models. (10 Marks)
- 3 a. What is an assignment problem? (03 Marks)
b. Use Vogel's Approximation Method (VAM) to find initial basic feasible solution, for the following transportation problem.

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

- c. Explain the various assumption, Advantages and limitation of linear programming models. (07 Marks)
(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 4 a. What is pure strategy and mixed strategy? (03 Marks)
 b. A company management and the labour union are negotiating a new three year settlement. Each of these has 4 strategies. The costs to the company are given for every pair of strategy choice.

Union strategies	Company strategies			
	I	II	III	IV
I	20	15	12	25
II	25	14	8	10
III	40	2	10	5
IV	-5	4	11	0

- What strategy will the two sides adopt? Also determine the value of the game. (07 Marks)
 c. Determine an initial basic feasible solutions to the following transportation problem by using
 i) NWCM ii) LCM.

Source \ Destination	D ₁	D ₂	D ₃	Supply
	S ₁	6	4	1
S ₂	3	8	7	40
S ₃	4	4	2	60
Demand	20	95	35	

(10 Marks)

- 5 a. What is network analysis? (03 Marks)
 b. Find the best strategy for each player and value of the game.

Player A	Player B	
	B ₁	B ₂
A ₁	1	-1/2
A ₂	-1/2	0

(03 Marks)

- c. The following matrix gives the payoff (Rs.) of different strategies S₁, S₂ and S₃ against conditions N₁, N₂ and N₃. What is the best strategy based on i) maximini criterion ii) Laplace criterion.

Strategies	States of nature		
	N ₁	N ₂	N ₃
S ₁	7,00,000	3,00,000	1,50,000
S ₂	5,00,000	4,50,000	0
S ₃	3,00,000	3,00,000	3,00,000

(10 Marks)

- 6 a. What are the objectives of scheduling? (03 Marks)
 b. What are the steps of decision – making process? (07 Marks)
 c. Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC. Processing times (in hours) are given in the following table

Job	:	1	2	3	4	5
Machine A	:	8	10	6	7	11
Machine B	:	5	6	2	3	4
Machine C	:	4	9	8	6	5

(10 Marks)

- 7 a. What do you mean by simulation? (03 Marks)
 b. A bakery keeps stock of a popular brand of cake previous experience shows the daily demand pattern for the item with associated probabilities as given below :

Daily demand (No)	:	0	10	20	30	40	50
Probability	:	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days.
 Random numbers 6, 40, 19, 87, 83, 73, 84, 29, 09, 02, 20

(07 Marks)

- c. The following network diagram represents activities associated with a project (weeks)

Activities	:	A	B	C	D	E	F	G	H	I
Optimistic time	:	5	18	26	16	15	6	7	7	3
Pessimistic time	:	10	22	40	20	25	12	12	9	5
Most likely time	:	8	20	33	18	20	9	10	8	4

Determine the following :

- The critical path
- The length of the critical path
- The probability of expected completion time of the project if the original scheduled time of completing the project is 41.5 weeks.

(10 Marks)

8 CASE STUDY [Compulsory]

- a. Draw network diagram for the following data :

Determine: i) Critical path and its length ii) Total and free float.

Activities	:	1-3	1-4	2-6	2-7	3-4	4-9	7-8	8-10
Duration	:	2	13	9	2	10	6	4	10

(10 Marks)

- b. An agriculturist has a 125 acre farm. The produces radish, muttar and potato. Whatever he raises is sold fully in the market. He gets Rs. 5 per kg for radish Rs. 4 per kg for muttar and Rs. 5 per kg for potato. The average per acre yield is 1500Kg of radish, 1800Kg of muttar and 1200kg of potato. To produce each 100Kg of radish and muttar and 80kg of potato, a sum of Rs. 12.50 has to be used for manure. Labour required for each acre to raise the crop is 6 man-days for radish and potato each and 5 man-days for muttar. A total of 500 man-days of labour at a rate of Rs. 40 per man-day is available.
 Formulate this as a linear programming model to maximize the agriculturist's total profit.

(10 Marks)
