

(iii) The probability of a favourable market is 25%, the probability of an average market is 45%, and the probability of an unfavourable market is 30%. What option should Saima choose to optimise the expected value? What is the maximum Saima would be willing to pay for additional information? (7)

5. Write short notes on any three:

- (i) Integer Programming Problem
- (ii) Identification of infeasible, multiple and unbounded solution for an LPP using Simplex Method
- (iii) Application of Monte Carlo Simulation
- (iv) Types of Floats in network analysis (5×3)

1/12/2022 (M)
[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6434

Unique Paper Code : 61011503

Name of the Paper : Quantitative Techniques for Management

Name of the Course : **Bachelor of Management Studies (BMS), 2022 (LOCF)**

Semester : V

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **all** Questions
3. Use of **Simple Calculator** is allowed.
4. All Questions carry equal marks

1. Vincent Printing makes two types of handmade paper namely Premium and Ordinary. They have a contract to supply at least 5,000 cases of handmade paper. Both types of paper are made on the same machine and machine time available is limited to 1200 hours. Premium paper takes 18 minutes per case to manufacture while Ordinary paper requires 12 minutes per case. The profit on each case of Premium paper and Ordinary paper is Rs. 100 and Rs. 50 respectively.

- (i) Formulate the above problem as an LPP and solve using Simplex method.
- (ii) Write the dual of the LPP and examine its economic interpretation. (15)

2. (a) A company has three plants at locations A, B and C which supply to warehouses located at I, II, III, IV and V cities. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. Unit transportation costs (in rupees) are given below:

Given that the availability of resources is 300 and 480 units respectively, perform the sensitivity analysis with respect to the resource represented by S_i and objective function coefficient of variable X_2 . Interpret its implication for the obtained solution. (8)

(b) Saima owns a bakery and is considering three options for her shop next year. She can expand her current shop, move to a larger shop, or make no change. With a favourable market, the annual payoff is expected to be Rs. 56,000 if she expands, Rs.70,000 if she moves, and Rs.30,000 if she does nothing. With an average market, her payoff is likely to be Rs.21,000, Rs.35,000, and Rs.10,000 respectively. With an unfavourable market, the predicted payoff is ₹(-29,000), ₹(-45,000), and ₹5,000 respectively.

- (i) Which option should Saima choose if she uses the maximin criterion?
- (ii) Which option should Saima choose if she uses the Hurwicz criterion with $\alpha = 0.6$?

(ii) What will be the optimal cost and duration for project completion?

(iii) How many days at the minimum will the project take to complete and what shall be its associated cost? (15)

OR

4. (a) For an LPP with maximisation objective, evaluate the simplex table given below to determine the optimal solution and value of the objective function. Is the solution unique or multiple? Give reason for your answer. Find the shadow price of both the resources.

	C _j	40	50	0	0	
	Basis	X ₁	X ₂	S ₁	S ₂	b _i
X ₂	50	0	1	3/4	-1/4	105
X ₁	40	1	0	-1/2	1/2	90

From	To				
	I	II	III	IV	V
A	5	8	6	6	3
B	4	7	7	6	5
C	8	4	6	6	4

Determine an optimum distribution for the company in order to minimize the total transportation cost. (10)

- (b) The arrival behaviour of a bank employee reveals that if he is late on a day, he is 90% sure to be in-time the next day. Similarly, if he is on time on a day, there is a 30% chance that he will be late the next day. Formulate the transition probability matrix with the above information. What is the probability that the employee will be late on next-to-next day if he is in time currently? How often, in the long run, is he expected to be late for the office? (5)

3. (a) In a plant layout, four different machines M₁, M₂, M₃ and M₄ are to be erected in a machine shop. There are five vacant areas A, B, C, D and E. Because of limited space, Machine M₂ cannot be erected at area C and Machine M₄ cannot be

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erected at area A. The cost of erection (in Rs.'000) of machines is given below

Machine	Area				
	A	B	C	D	E
M1	4	5	9	4	5
M2	6	4	--	4	3
M3	4	5	8	5	1
M4	---	2	6	1	2

Find the optimal assignment plan. Also find which area will remain vacant. (8)

(b) Find the optimal strategies for the game with following payoff matrices. Also find the value of the game.

		Player B			
Player A		14	4	8	18
		8	3	2	12
		8	7	-6	16
		6	5	12	10

(7)

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4. The data for a project is given below:

Activity	Time (in days)		Direct Cost (in Rs)	
	Normal	Crash	Normal	Crash
1-2	4	3	60	90
1-3	2	1	45	60
1-4	6	4	150	250
2-5	5	3	150	250
3-4	7	5	100	160
3-5	2	2	100	100
4-6	4	2	100	140
5-6	3	1	80	100

Indirect cost varies as follows:

Days : 14 13 12 11 10 9 8 7

Cost (Rs) : 500 400 250 175 100 75 50 35

(i) Draw the network diagram for the above project and find the critical path. State the project completion time and project cost.

P.T.O.