

MBA-2 Sem.-3 (Evening) Examination

MS

January-2024

Time : 2-30 Hours]

[Max. Marks : 70

- Instructions: (1) This paper contains **FIVE** questions.
 (2) All questions are compulsory.
 (3) Question No.2, 3, 4 have internal options.
 (4) Figures in the right side in parenthesis indicate marks.
 (5) Use of Scientific Calculator is allowed.

- Q:1** Answer the following. (Any two) (14)
1. Infeasibility & unboundedness in graphical method of LPP
 2. Travelling salesman problem v/s assignment problem
 3. Markovian chain
 4. Network techniques

- Q:2 (a)** A company manufactures 3 types of parts which use precious metals platinum and gold. Due to shortage of these precious metals, the government regulates the amount that may be used per day. The relevant data with respect to supply, requirements and profits are summarised in the table as follows: (07)

Product	Platinum required/Unit (gms)	Gold required/Unit (gms)	Profit/unit (Rs.)
A	2	3	500
B	4	2	600
C	6	4	1200

Daily allotment of platinum and gold are 160 gm and 120 gm respectively. How should the company divide the supply of scarce precious metals? Formulate it as a linear programming problem.

- Q:2 (b)** Calculate transition probability from following table. (07)

Particulars	Starting Customers	Loss			End Customers
		A	B	C	
A	200	0	20	20	220
B	500	35	0	15	490
C	300	25	20	0	290

OR

Q:2 (a) (07)

Warehouse	Market			Supply
	A	B	C	
1	10	12	7	180
2	14	11	6	100
3	9	5	13	160
4	11	7	9	120
Demand	240	200	220	

Calculate IBFS from following cost matrix using any method of your choice.

Calculate Hungarian Assignment Method from the following table.

Q:2 (b) (07)

Clerks	Jobs (Time taken in hours)			
	1	2	3	4
A	80	70	75	72
B	75	75	80	85
C	78	78	82	78

Q:3 (a) (07)

Assume that at a bank teller window the customers arrive in their cars at the average rate of 20 per hour according to a Poisson distribution. Assume also that the bank teller spends an average of 2 minutes per customer to complete a service, and the service time is exponentially distributed. Customers, who arrive from an infinite population, are served on a first-come-first-served basis, and there is no limit to possible queue length.

- What is the expected waiting time in the system per customer?
- What is the mean number of customers waiting in the system?
- What is the probability of zero customers in the system?
- What value is the utilization factor?

Q:3 (b) (07)

Refer the Q:2 (a) of transportation problem and formulate the same as LPP.

OR

Q:3 (14)

A LP problem was formulated and solved by computer package. Perform the analysis form the given output.

$$\text{Max } Z = 5X_1 + 4X_2$$

Subject to,

$$6X_1 + 4X_2 \leq 24 \text{ (raw material 1 in tons)}$$

$$X_1 + 2X_2 \leq 6 \text{ (raw material 2 in tons)}$$

$$-X_1 + X_2 \leq 1 \text{ (difference between two, does not exceed 1)}$$

$$X_2 \leq 2 \text{ (maximum demand)}$$

$$X_1, X_2 \geq 0$$

Variable	Value	Obj coeff	Obj val
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X1	3.00	5.00	contribution	
X2	1.50	4.00	6.00	
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Constraints	RHS	Slack- surplus+		
1(<)	24.00	0.00		
2(<)	6.00	0.00		
3(<)	1.00	2.50-		
4(<)	2.00	0.50-		
<hr/>				
Sensitivity Analysis				
Variable	Current	Min	Max	Reduced
	Coeff	Coeff	Coeff	Cost
X1	5.00	2.00	6.00	0.00
X2	4.00	3.33	10.00	0.00
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Constraint	Curr RHS	Min RHS	Max RHS	Dual price
1(<)	24.00	22.00	36.00	0.75
2(<)	6.00	4.00	6.67	0.50
3(<)	1.00	-1.50	Infinity	0.00
4(<)	2.00	2.50	Infinity	0.00

- 1) What is the best product mix?
- 2) What is the optimal contribution?
- 3) What are the shadow prices?
- 4) When the optimal solution has been reached, which resource has the highest marginal value?
- 5) State the dual of this problem.
- 6) Range of objective function coefficients.
- 7) RHS range.
- 8) Company wants to increase profit margin on X1 upto Rs. 7
- 9) Company wants to decrease profit margin on X2 upto Rs. 2
- 10) State the dual of this problem.

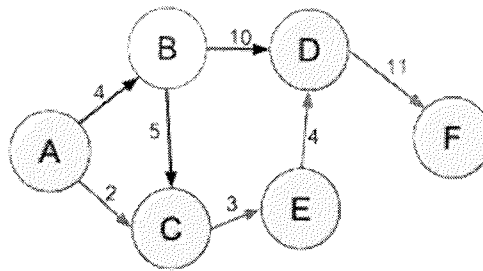
Q:4 (a) Write a detailed note on Queuing theory.

(07)

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Q:4 (b)

(07)



XYZ Ltd. wants to send parcel from origin to destination, suggest shortest distance by applying appropriate method.

OR

Q:4

In a certain market, only two brands of lipsticks, A and B, are sold. Given that a lady last purchased lipstick A, there is 80% chance that she would buy the same brand in the next purchase, while if a lady purchased brand B, there is 90% chance that her next purchase would be brand B. Using this information, develop the transition probability matrix. Now, calculate (14)

- (1) The probability that if a customer is currently a brand A purchaser, she will purchase brand B two purchases from now;
- (2) The probability that if a customer is a brand B purchaser, she will purchase brand A three Periods from now;
- (3) The probability that three periods from now, a customer shall buy brand B, given that the market share of the two brands is as follows: Brand A-70%, Brand B-30%;
- (4) The steady state probabilities.

Q:5

(a)

Maximise

$$Z = 40x_1 + 35x_2$$

Subject to

$$2x_1 + 3x_2 \leq 60$$

$$4x_1 + 3x_2 \leq 96$$

$$x_1, x_2 \geq 0$$

(14)

1. Use graphical method to determine product mix.
2. Also convert above LPP into dual problem.

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