MASTER OF BUSINESS ADMINISTRATION (RETAIL SERVICES) (MBARS)

Term-End Examination

June, 2013

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MRS-009 : OPERATIONS RESEARCH

Time : 3 hours *Maximum Marks : **100***

Note : Attempt **any four** questions.

All questions carry **equal** marks.

1. (a) Use the graphical method to solve the following LP problem. **10+2=12**

    Maximize $Z = 2x_1 + 3x_2$

    Subject to the constraints

    $x_1 + x_2 \le 30$

    $x_2 \ge 3 ; 0 \le x_2 \le 12 ; 0 \le x_1 \le 20$

    $x_1 - x_2 \ge 0$ and $x_1, x_2 \ge 0$

   (b) Use Penalty (Big M) method to solve the following LP problem **10+3=13**

    Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

    Subject to the contraints

    $x_1 + 2x_2 + 3x_3 = 15$

    $2x_1 + x_2 + 5x_3 = 20$

    $x_1 + 2x_2 + x_3 + x_4 = 10$

    and $x_1, x_2, x_3, x_4 \ge 0$

2. Consider the transportation problem presented in **25** the following table :

Distribution Center

		D_1	D_2	D_3	D_4	Supply
PLANT	P_1	19	30	50	12	7
	P_2	70	30	40	60	10
	P_3	40	10	60	20	18
Requirement		5	8	7	15	

To obtain an optimal solution using modi method by Matrix Minimum Method.

3. (a) In a certain market, only two brands of **15** 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 :

(i) The probability that if a customer is currently a brand A purchaser, she will purchase brand B two purchases from now.

(ii) The probability that if a customer is a brand B purchaser, she will purchase brand A three periods from now ;

(iii) The probability that three periods from now a customer shall buy brand B, given that the market share of two brands is as follows :

Brand A 70%   Brand B 30%.

(b) What is Linear programming and limitations of it ?   **10**

4. The probability of the demand for lorries for hiring on any day in a given district follows :   **25**

No. of lorries demanded	probability
0	0.1
1	0.2
2	0.3
3	0.2
4	0.2

Lorries have a fixed cost of Rs. 90 each day to keep the daily hire charges (variable costs of running) Rs. 200. If the lorry hire company owns 4 lorries, what is its daily expectation ? If the company is about to go into business and currently has no lorries. How many lorries should it buy ?

5. **(a)** A glass factory that specializes in crystal is **12** developing a substantial backlog and for this the firm's management is considering three courses of action :

To arrange for subcontracting (S_1), to begin overtime production (S_2) and to construct new facilities (S_3). The correct choice depends largely upon the future demand, which may be low, medium or high. By consensus management ranks the respective probabilities as 0.10, 0.50 and 0.40. A cost analysis reveals the effect upon the profits. This is shown in the table below.

Demand	Probability	Course of Action		
		S_1	S_2	S_3
Low (L)	0.10	10	-20	-150
Medium (M)	0.50	50	60	20
High (H)	0.40	50	100	200

(b) Give a general structure of the queuing **13** system and explain the operating characteristics of queuing system.

6. A company has four sales representatives who **25** are to be assigned to four different sales territories. The monthly sale increases estimated for each representative for different sales territories (in lakh of Rs.) are shown in the following table :

Sales Representative	Sales Territories			
	I	II	III	IV
A	200	150	170	220
B	160	120	150	140
C	190	195	190	200
D	180	175	160	190

Suggest optimal assignment and the total maximum sales increase per month.

If for certain reasons, sales representative B cannot be assigned to sales territory 3, will the optimal assignment schedule be different ? If so, find that schedule and the effect on total sales.

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