

Master of Business Administration (MBA) Examination
II Semester

Operations Research

Time : 3 Hours]

[Max. Marks : 90

Note : Answer any two questions from Section A each consisting of 18 marks. Answer any three questions from Section B each consisting of 18 marks.

Section A

1. "In business there is always an application of OR." Support the statement with examples.
2. What do you mean by Mathematical Model of Transportation ?
3. Write short notes on : (any two)
 - (a) Dynamic Programming. (b) Monte Carlo Technique of Simulation.
 - (c) Mixed and Pure Strategy in Game Theory.

Section B

1. Seles Depot

Factory	S ₁	S ₂	S ₃	Availability
F ₁	6	6	1	10
F ₂	-2	-2	-4	150
F ₃	3	2	2	50
F ₄	8	5	3	100
Requirement	80	120	150	

Determine the most profitable production and distribution schedule and corresponding profit. The deficit production shall be taken to yield zero profit. (Element of Matrix is profit)

2. (a) Arrival and service at bakery shop follows Poisson and Exponential Distribution respectively. A single salesman can attend customers at an avg. rate of 12/hr and customer arrive at 12/hr. Find (i) Mean no. of customers in bakery (ii) Mean time spent by customer in bakery (iii) Expected no. of customers waiting to be served (iv) Mean waiting time of a customer in queue.
- (b) Solve by Simplex : Min. $z = 4x_1 + 3x_2$
 Sub. to constraints : $200x_1 + 100x_2 \geq 4000$
 $x_1 + 2x_2 \geq 50$
 $40x_1 + 40x_2 \geq 1400$
 $x_1, x_2 \geq 0.$

3. (a) The management of a hotel, having 500 rooms each having 6 bulbs, replaces the bulb as they fail @ Rs. 3 each. The cost reduces by Rs. 2 per bulb by adopting periodic replacement policy. On basis of information, give suggestion.

Month of use	1	2	3	4	5
% of bulbs failing by that month	10	25	50	80	100

- (b) Obtain the optimal strategy for both players and value of game for 2-person zero sum game (graphically).

$$\begin{array}{c}
 B_1 \quad B_2 \quad B_3 \quad B_4 \quad B_5 \\
 A_1 \left[\begin{array}{ccccc} 2 & -1 & 5 & -2 & 6 \end{array} \right] \\
 A_2 \left[\begin{array}{ccccc} -2 & 4 & 3 & 1 & 0 \end{array} \right]
 \end{array}$$

4. (a) A methods engineer wants to assign 4 new methods to work centres. Assignment of new methods will increase productions. One method can be assigned to one work centre. Assign :
Increase in Production / Unit

Methods ↓	Work Center			
	I	II	III	IV
A	38	29	33	22
B	26	27	28	28
C	34	26	32	29
D	33	21	26	28
E	31	26	31	26

- (b) Solve graphically :

$$\begin{array}{l}
 \text{Max. } z = 80x_1 + 120x_2 \\
 \text{Sub. to } \quad x_1 + x_2 \leq 9 \\
 \quad \quad \quad x_1 \geq 2, x_2 \geq 3 \\
 \quad \quad \quad 20x_1 + 50x_2 \leq 360 \\
 \quad \quad \quad x_1, x_2 \geq 0.
 \end{array}$$

5. (a) Canteen of a college keeps stock of a popular brand of cold drink. Previous experience shows daily demand as :

Daily Demand	:	0	10	20	30	40	50
Probability	:	.04	.16	.15	.48	.12	.05

Consider following sequence of random nos to stimulate demand for 10 days. Also find avg. daily demand and stock :

48, 78, 19, 51, 56, 77, 15, 14, 68, 09.

- (b) Mr. X purchases a new car every 2 years. He prefers a brand A car but sometimes buy another brand. Mr. X places ten slips in a bowl numbered 1 to 10 and draws one slip. If the present car is A and no. on slip is 8 or less, he again purchases brand A. If he presently owns brand B and no. of slip is 6 or less, he will next purchase brand A car.

(i) Construct and interpret the state transition matrix in terms of retention and loss and retention and gain.

(ii) Calculate probability of Mr. X purchasing brand A car at the end of II and III period. Use Markov process.