August 2008

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. Discuss the origin and development of Operations Research. What are limitations and characteristics of Operations Research?
2. (a) Explain the significance of the following variables with examples :
   (i) Slack Variables, (ii) Surplus Variables and (iii) Artificial Variables.
   (b) What is degeneracy in transportation problem? How it is resolved?
3. Write notes on any two of the following :
   (a) Dynamic Programming (b) Inter Programming
   (c) Group Replacement Policy (d) Travelling Salesman Problem.

Section B

4. (a) An animal feed company must produce 200 kg. of a mixture consisting of ingredients X_1 and X_2. The ingredient X_1 costs Rs. 3 per kg. and X_2 costs Rs. 5 per kg. Not more than 80 kg. of X_1 can be used and atleast 60 kg. of X_2 must be used. Find the minimum cost mixture.
   (b) Solve the following problem using Simplex method :
   Maximize $z = 3x_1 - x_2$
   Subject to $2x_1 + x_2 \leq 2$
   $x_1 + 3x_2 \geq 3$
   $x_2 \leq 4$
   $x_1, x_2 \geq 0.$
5. (a) Determine optimal solution to the transportation problem given below. Obtain the initial solution by VAM.

Transportation Cost (Rs./unit)

Plant \ Market	M_1	M_2	M_3	M_4	Supply
P_1	6	4	9	1	40
P_2	20	6	11	3	40
P_3	7	1	0	14	50
P_4	7	1	12	6	90
Demand	90	30	30	30	

(b) Solve the following assignment problem and obtain the minimum cost at which all the jobs can be performed :

Job (Cost in 00 Rs.")

Worker	1	2	3	4	5
A	25	18	32	20	21
B	34	25	21	12	17
C	20	17	20	32	16
D	20	28	20	16	17

6. (a) The cost of a new machine is Rs. 5,000. The maintenance cost of n-th year is given by $C_n = 500 (n - 1)$, $n = 1, 2, ...$ Suppose that the discount rate per year is 0.05. After how many years it will be economical to replace the machine by a new one?

(b) Suppose that a bakery keeps a record of the sale of the number of cakes of a certain type. Information relating to 200 days' sales is :

Demand (No. of Cakes)	:	5	6	7	8	9	10	11	12	Total
No. of Days	:	4	10	16	50	62	38	12	8	200

Using the following random numbers :

61, 74, 24, 03, 59, 16, 84, 92, 52, 07

stimulate the demand of cakes for 10 days.

7. (a) A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and of the arrival of sets is approximately Poison with an average rate of 10 per 8-hour day. What is repairmen's expected idle time each day? How many jobs are ahead of the average set just brought in?

(b) Recently, a market research team has conducted a survey of consumer buying habits with respect to three kinds of telcum powder in an area. It estimates that, atleast, 20% of the customers buy brand A, 50% of the customers buy brand B and 30% of them buy brand C. In addition, the firm has analyzed the survey data and has determined the following brand switching matrix :

Brand Next Bought

Brand Just Bought	A	B	C
A	0.6	0.3	0.1
B	0.4	0.5	0.1
C	0.2	0.1	0.7

What will be the expected distribution of customers two time periods later?

8. Solve the following game by algebraic method :

Player B

Player	I	II	III
I	−1	2	1
II	1	−2	2
III	3	4	−3

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