12MBA22

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Second Semester MBA Degree Examination, Dec.2015/Jan.2016
Quantitative Methods - II

Time: 3 hrs.

Max. Marks:100

Note: 1. *Answer any THREE questions from Q.No. 1 to Q.No. 6.*
2. *Question No. 7 & 8 are compulsory.*

1   a. Define Operations Research. **(03 Marks)**
     b. Briefly explain features of Operation Research. **(07 Marks)**
     c. A manufacturing company is engaged in producing three types of products A, B and C. The production department produces each day, components sufficient to make 50 units of A, 25 units of B and 30 units of C. The management is confronted with the problem of optimizing daily production of products in assembly department where only 100 man – hours are available daily to assemble the products. The following additional information is available

Type of product	Profit contribution per unit of products (Rs)	Assembly time per product (hrs)
A	12	0.8
B	20	1.7
C	45	2.5

The company has a daily order commitment for 20 units of product A and a total of 15 units of products B and C. Formulate this problem as an LP model so as to maximize the total profit. **(10 Marks)**

2   a. What are restricted or prohibited routes in transportation problem? **(03 Marks)**
     b. A company has three factories S_1, S_2 and S_3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four ware houses D_1, D_2, D_3 and D_4 with requirements of 5, 6, 7 and 14 units (in 100s) per week respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below : **(07 Marks)**

	D_1	D_2	D_3	D_4	Capacity
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

Use Least cost method to get Initial Basic Feasible Solution.
     c. In the modification of a plant layout of a factory four new machines M_1, M_2, M_3 and M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, M_2 cannot be placed at C and M_3 cannot be placed at A. The cost of locating a machine at a place (in 00s rupees) is shown below. Find the optimal assignment schedule. **(10 Marks)**

Location

Machine	A	B	C	D	E
M_1	9	11	15	10	11
M_2	12	9	-	10	9
M_3	-	11	14	11	7
M_4	14	8	12	7	8

3 a. What is Simulation? (03 Marks)

b. Bring out the difference between Critical Path Method (CPM) and Project Evaluation Review Technique (PERT) Method. (07 Marks)

c. Explain different models of Operations Research. (10 Marks)

4 a. Explain Total float and Free float. (03 Marks)

b. Draw an network diagram showing the following relationship : (07 Marks)

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Immediate Predecessor	-	-	-	A, B	B, C	A, B	C	D, E, F	D	G	G	H, J	K	I, L

c. Solve the following transportation problem using VAM method and test for optimality. (10 Marks)

		Destination				
		P	Q	R	S	Supply
Source	A	21	16	25	13	11
	B	17	18	14	23	13
	C	32	17	18	41	19
	Demand	6	10	12	15	43

5 a. Define a Saddle point. (03 Marks)

b. Explain Queuing system. (07 Marks)

c. Solve the following game graphically and find the value. (10 Marks)

Player B

$$\text{Player A} \begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$$

6 a. What do you mean by degeneracy in transportation problem? (03 Marks)

b. Explain decision making process. (07 Marks)

c. Customers arrive at a one window drive in bank according to Poisson distribution with mean 10/hour. Service time per customer is exponential with mean 5 minutes the space in front of the window including that for the serviced car can accommodate a maximum of 3 cars others can wait outside this space.

i) What is the probability that an arriving customer can drive directly to the space in front of the window?

ii) What is the probability that an arriving customer will have to wait outside the indicated space?

iii) How long is an arriving customer expected to wait before starting service? (10 Marks)

7 a. Explain any three assumptions of sequencing or scheduling. (03 Marks)

b. Schedule the following jobs using Johnson's rule and find total elapsed time : (07 Marks)

	Processing time for Jobs				
Machines	A	B	C	D	E
M_1	4	13	7	12	6
M_2	3	15	5	6	11

c. A project manager has obtained the following optimistic , pessimistic and most likely times in weeks relating to the various activities related to the construction of a power project.

Activity Sequence	Time Estimates		
	Optimistic	Most likely	Pessimisitic
1-2	6	9	18
1-3	5	8	17
2-4	4	7	22
2-5	4	7	10
3-4	4	7	16
3-5	2	5	8
4-5	4	10	22

i) Draw a PERT diagram and mark clearly the critical path.
ii) What is the probability that the power project would be successfully completed in 32 weeks? Area Table data : **(10 Marks)**

$\dfrac{X - \mu}{\sigma}$	0.42	0.50	1.00
Area	0.1628	0.1915	0.3413

8 a. Use graphical method to solve the following LP problem :
   Maximize $Z = -x_1 + 2x_2$
   Subject to constraints $-x_1 + 3x_2 \le 10$
   $x_1 + x_2 \le 6$
   $x_1 - x_2 \le 2$
   $x_1, x_2 \ge 0$. **(10 Marks)**

   b. XYZ Bakery keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given below :

Daily Demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

   Consider the following random numbers :
   R.No. 48, 78, 19, 51, 56, 77, 15, 14, 68, 09.
   Simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 30 Cakes every day. **(10 Marks)**

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