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10MBA21

**Second Semester MBA Degree Examination, December 2012**  
**Quantitative Technique for Management**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FOUR full questions from Q.No.1 to 7.**  
**2. Q.No. 8 is compulsory.**

- 1 a. What is degeneracy? (03 Marks)  
 b. Explain procedure involved in Monte Carlo method of simulation. (07 Marks)  
 c. What is operations research? Brief about different models of operations research. (10 Marks)
- 2 a. Write any three assumptions made under sequencing models. (03 Marks)  
 b. A firm proposes to purchase some fans and sewing machines. It has only Rs.5760 to invest and a space for at most 20 items. A fan costs Rs.360 and a sewing machine Rs.240 profit expected from a fan is Rs.22 and from a sewing machine is Rs.18. Using graphic method of solution determine the number of fans and sewing machines, he should purchase to maximize his profit. (07 Marks)  
 c. From the following data relating to a project:

- i) Find expected duration and variance of each activity.  
 ii) Draw the network diagram and find expected project length.  
 iii) Find the probability that the project will be completed with in 30 weeks.

Activity	Name of activity	Duration		
		Optimistic	Pessimistic	Most likely
1-2	A	1	7	1
1-3	B	3	7	5
1-4	C	2	8	2
2-5	D	1	1	1
3-5	E	3	9	6
4-6	F	2	8	5
5-6	G	4	14	6
6-7	H	6	10	8
5-7	I	3	11	7

(10 Marks)

- 3 a. Write any 3 factors which account for the popularity of simulation technique. (03 Marks)  
 b. In the modification of a plant layout of a factory, four new machines  $M_1, M_2, M_3, M_4$  are to be installed in a machine shop. There are 5 vacant places A, B, C, D and E are available. Because of limited space, machine  $M_2$  cannot be placed at C and  $M_3$  cannot be placed at A. The cost of locating machine i to place j is:

Machines	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

Find the optimal assignment schedule.

(07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg,  $42+8=50$ , will be treated as malpractice.

- c. Solve the following game by graphical method: (10 Marks)

		B			
		y <sub>1</sub>	y <sub>2</sub>	y <sub>3</sub>	y <sub>4</sub>
A	x <sub>1</sub>	19	6	7	5
	x <sub>2</sub>	7	3	14	6
	x <sub>3</sub>	12	8	18	4
	x <sub>4</sub>	8	7	13	-1

- 4 a. List out the phases of operations research. (03 Marks)  
 b. From the following information draw a network diagram and calculate E<sub>st</sub>, E<sub>ft</sub>, L<sub>st</sub>, L<sub>ft</sub> for all activities. Find critical path: (07 Marks)

Name of the activity	Pre-requisite activity	Duration
A	None	2
B	None	3
C	None	4
D	A	6
E	B	7
F	C	5
G	D and E	8
H	B	9
I	H and F	5

- c. An agriculturist has a 125 acre farm. He produces radish, muttar and potato. Whatever he raises is sold fully in the market. He gets Rs.5 per kg for radish, Rs.4 per kg for muttar and Rs.5 per kg for potato. The average per acre yield is 1500 kg of radish, 1800 kg of muttar and 1200 kg of potato. To produce each 100 kg of radish and muttar and 80 kg of potato, a sum of Rs.12.50 has to be used for manure. Labour required for each acre to raise the crop is 6 man days for radish and potato each and 5 man days for muttar. The total of 500 man days of labour at a rate of Rs.40 per man day is available. Formulate this as a linear programming model to maximize the agriculturist's profit. (10 Marks)
- 5 a. Differentiate between 'total float' and 'free float'. (03 Marks)  
 b. Solve the game for the following pay off matrix using a suitable method: (07 Marks)

		y					
		1	2	3	4	5	6
x	1	0	0	0	0	0	0
	2	4	2	0	2	1	1
	3	4	3	1	3	2	2
	4	4	3	7	-5	1	2
	5	4	3	4	-1	2	2
	6	4	3	3	-2	2	2

- c. Arrivals at a telephone booth are considered to be on Poisson with an average time of 10 minutes. The length of a phone call assumed to be distributed exponentially with mean of 5 minutes.
- i) What is the probability that a person arriving at the booth will have to wait?
  - ii) What is the average length of the queues that form from time to time?
  - iii) The telephone department will install a second booth when convinced that an arrival would wait at least 10 minutes for the phone. By how much the flow of arrivals to be increased in order to justify a second booth. (10 Marks)

- 6 a. What are the objectives of queuing theory models? Write any three. (03 Marks)  
 b. Write the dual of the following primal:

Objective:

Minimum  $Z = 4x_1 + 5x_2 - 3x_3$ .

Subject to constraints:  $x_1 + x_2 + x_3 = 22$

$3x_1 + 5x_2 - 2x_3 \leq 65$

$x_1 + 7x_2 + 4x_3 \geq 120$

where  $x_1$  and  $x_2 \geq 0$ ,  $x_3$  is unrestricted. (07 Marks)

- c. ABC enterprise has three plants manufacturing dry cells, located at different locations. Production cost differs from plant to plant. There are five offices of the company located in different regions of the country. The selling prices differ from region to region. Costs of shipping and production, sales information is given below:

Plant number	Shipping cost					Production capacity	Production cost per unit
	A	B	C	D	E		
1	1	1	5	9	4	150	20
2	9	7	8	3	6	200	22
3	4	5	3	2	7	125	18
Demand	80	100	75	45	125		
Selling price per unit	30	32	31	34	29		

Find out the profitable distribution schedule for IBFS through VAM method. (10 Marks)

- 7 a. Differentiate between 'maximin' and 'minimax' strategies. (03 Marks)  
 b. Explain about elements of queuing system. (07 Marks)  
 c. Owner of a plumbing and heating company which maintains stock of water heaters and sells likes idea of having a large supply on hand so as to meet customer demand and examines heater sales over the past 50 weeks and notes the following:

Heater sales per week:	4	5	6	7	8	9	10
No. of weeks this no sold:	6	5	9	12	8	7	3

Using random numbers 10, 24, 03, 32, 23, 59, 95, 34, 34, 51, simulate demand for 10 weeks and answer the below questions:

- i) If company maintains a constant supply of 8 heaters in any given week, how many times will he be out of stock during 10 week simulation period?  
 ii) What is the average number of heaters demanded per week? (10 Marks)
- 8 a. What is redundant constraint in linear programming model? (03 Marks)  
 b. Brief about characteristic features of operations research. (07 Marks)  
 c. Provide the optimal job sequencing involving three machines  $M_1, M_2, M_3$  in the order of  $M_1, M_2$  and  $M_3$  for the following data:

		Job				
		J <sub>1</sub>	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	J <sub>5</sub>
Machine	M <sub>1</sub>	7	12	11	9	8
	M <sub>2</sub>	8	9	5	6	7
	M <sub>3</sub>	11	13	9	10	14

(10 Marks)

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