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**Second Semester MBA Degree Examination, June 2012**  
**Quantitative Techniques for Management**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions from.**  
**2. Use of statistical tables is permitted.**

- 1 a. Define operations research. (03 Marks)
- b. Discuss the characteristics and limitations of operations research. (07 Marks)
- c. Explain the methodology of operations research. (10 Marks)

- 2 a. What are the three components of linear programming? (03 Marks)
- b. Write the dual of the following LPP :  
 Maximize  $z = 2x_1 - x_2 + x_3$   
 Subject to constraints  $x_1 + x_2 - 3x_3 \leq 8$   
 $4x_1 - x_2 + x_3 \geq 2$   
 $2x_1 + 3x_2 - x_3 = 4$   
 and  $x_1, x_2$  and  $x_3 \geq 0$  (07 Marks)

- c. Solve the following LPP graphically  
 Maximize  $z = 4x_1 + 3x_2$   
 $2x_1 + x_2 \leq 1000$   
 $x_1 + x_2 \leq 800$   
 $x_1 \leq 400$   
 $x_2 \leq 700$   
 and  $x_1, x_2 \geq 0$  (10 Marks)

- 3 a. Define transportation problem. (03 Marks)
- b. Solve the following assignment problem :

		Job			
		1	2	3	4
	A	18	26	17	11
	B	13	28	14	26
	C	38	19	18	15
	D	19	26	24	10
Worker					

(07 Marks)

- c. Find the optimum solution of the transportation problem (use VAM for initial solution). (10 Marks)

		Destination				
		1	2	3	4	
	A	11	13	17	14	250
	B	16	18	14	10	300
	C	21	24	13	10	400
Source						
	Demand	200	225	275	250	950

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.

- 4 a. What do you mean by crashing of an activity? (03 Marks)  
 b. Distinguish between PERT and CPM. (07 Marks)  
 c. A project is comprised of eight activities, whose time estimates (in days) are listed below.

Activity i – j	Time estimates		
	Optimistic	Most likely	Pessimistic
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 6	2	5	8
5 – 6	3	6	15
6 – 7	1	2	3

- i) Draw a network diagram.  
 ii) Determine the critical path and compute the expected project completion time.  
 iii) What is the probability that the project will be completed in 4 week earlier than the expected time? (10 Marks)
- 5 a. Define : i) Pure strategy ; ii) Mixed strategy and iii) Optimum strategy. (03 Marks)  
 b. Solve the following game using dominance rule : (07 Marks)

		Player B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Player A	A <sub>1</sub>	3	2	4	0
	A <sub>2</sub>	3	4	2	4
	A <sub>3</sub>	4	2	4	0
	A <sub>4</sub>	0	4	0	8

- c. Solve the following game graphically : (10 Marks)

		Player B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Player A	A <sub>1</sub>	2	1	0	-2
	A <sub>2</sub>	1	0	3	2

- 6 a. What are the assumptions underlying in sequencing problems? (03 Marks)  
 b. A company manufactures two products A and B. Each unit of 'B' requires twice as much time to produce as of A. The company have time to produce a maximum of 2000 units/day and each type requires equal amount of it. Product 'B' requires a special ingredient of which there are 600 units/day available. The profits are Rs.30 and Rs.50 per unit respectively of A and B Formulate this as an LPP. (07 Marks)  
 c. In firm, there are six jobs to perform, each of which should go through two machines A and B in the order AB. The processing times (hrs) for the jobs are given below. Determine the optimum sequence of jobs that minimizes the total elapsed time. (10 Marks)

Job	1	2	3	4	5	6
Machine A	3	12	5	2	9	10
Machine B	8	10	9	6	3	1

- 7 a. Write the general form of a queuing model. **(03 Marks)**  
b. Explain the elements of a queueing system. **(07 Marks)**  
c. The arrival of customers at a super market follows Poisson distribution with a mean of 4 per hour and their service rate follows exponential distribution with a mean of 12 per hour. Determine :  
i) Average number of customers in the system.  
ii) Average number of customers in the queue.  
iii) Average time a customer spends in the system.  
iv) Average time a customer spends in the queue. **(10 Marks)**
- 8 a. What is simulation? **(03 Marks)**  
b. Explain Monte-Carlo simulation technique. **(07 Marks)**  
c. A tourist car operator finds that during the past few weeks, the usage of cars has varied so much that cost of maintenance has varied considerably. During past 200 weeks, the demand for a car is given.

Trips/week	0	1	2	3	4	5
Demand	16	24	30	60	40	30

Using the following random numbers, simulate the demand for the next 10 weeks.

Random numbers : 82 96 18 96 20 84 56 11 52 03 **(10 Marks)**

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