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Total number of printed pages – 3

MBA  
MBA 104

**First Semester (Back / Special) Examination – 2013**

**QUANTITATIVE TECHNIQUES**

**QUESTION CODE : D 495**

**Full Marks – 70**

**Time : 3 Hours**

*Answer Question No. 1 which is compulsory and any **five** from the rest.  
The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2 × 10
- (a) Why do we require slack, surplus and artificial variables in LPP ?
  - (b) Write the mathematical formulation of assignment problem.
  - (c) What is the difference between transportation problem and transshipment problem ?
  - (d) What are the different decision-making environments ?
  - (e) Discuss the factors to be considered for replacement decisions.
  - (f) Define the terms 'pay off table', 'courses of action', 'state-of nature'.
  - (g) What is a saddle point ?
  - (h) What are the characteristics of a Markov process ?
  - (i) State Johnson's rule and describe its application in sequencing n jobs on 2 machines.
  - (j) Write the rules of writing a dual of any given LPP.
2. A company has factories at A, B and C which supply warehouses D, E, F and G. The factory capacities are 230, 280 and 180 respectively for regular production. The requirements at the warehouses are 165, 175, 205 and 145 respectively. The unit transportation costs are given below :

	D	E	F	G
A	15	18	22	16
B	15	19	20	14
C	13	16	23	17

Find the optimum transportation schedule.

10

P.T.O.

3. (a) Solve the LPP 7  
 Minimize  $Z = 40x_1 + 24x_2$   
 Subject to  $2x_1 + 5x_2 \geq 480$   
 $8x_1 + 5x_2 \geq 720$   
 $x_1, x_2 \geq 0$

- b) Write the Dual of the given LPP 3  
 Minimize  $Z = 3x_1 - 2x_2 + x_3$   
 Subject to  $2x_1 - 3x_2 + x_3 \leq 6$   
 $4x_1 - 3x_2 \geq 9$   
 $-8x_1 + 4x_2 + 3x_3 = 8$   
 $x_1, x_2 \geq 0$  and  $x_3$  is unrestricted.

4. Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table: 10

		Jobs				
		I	II	III	IV	V
Men	A	10	5	13	15	16
	B	3	9	18	3	6
	C	10	7	2	2	2
	D	5	11	9	7	12
	E	7	9	10	4	12

Find the assignment of jobs to the men that will minimize the total time taken.

5. (a) There are five jobs, each of which must go through machines A, B and C in the order ABC. Processing times (in hours) are given below: 5

Job	J1	J2	J3	J4	J5
Machine A	10	11	8	7	6
Machine B	6	4	5	3	2
Machine C	9	5	4	6	8

Determine a sequence of these jobs that minimizes the total elapsed time.

- (b) The data on the maintenance costs per year and resale prices of one equipment whose purchase price is Rs 60,000 are given below: 5

Year	1	2	3	4	5
Resale Value (Rs)	42,000	30,300	20,400	14,400	9,650
Maintenance Cost (Rs)	18,000	20,270	22,880	26,700	31,800

What is the optimum period of replacement ?

6. A company manufactures around 200 scooters. Depending on the availability of raw materials and other conditions, the daily production has been varying from 196 scooters to 204 scooters, whose probability distribution is given below : 10

Production per day :	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The finished scooters are transported in a specially designed lorry that has the capacity of 200 scooters. Using the following random numbers simulate the process and find out

- (i) what will be the average number of scooters waiting in the factory and
- (ii) what will be the number of empty spaces in the lorry.

Random numbers 93, 14, 72, 10, 21, 81, 87, 90, 38, 68

7. (a) Demand (in '000 metric tones) of sugar of Sweet India is given below : 5

Year	2003	2004	2005	2006	2007	2008	2009
Demand	77	88	94	85	91	98	90

Fit a straight line trend and forecast the demand for the year 2014.

- (b) Write briefly about different components of time series. 5

8. (a) A vendor sells a weekly magazine for Rs. 10 and purchases the same for Rs. 8. At the end of the week, the unsold copies of the magazines are disposed off for Rs. 3 each. According to the past experience the weekly demand for this magazine is between 70 and 75 copies. Construct the pay off table. How many magazines should he purchase each week to maximize his profit ? 5

- (b) What do you understand by decision tree analysis ? 5

