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12MBA22

**Second Semester MBA Degree Examination, Dec.2014/Jan.2015**  
**Quantitative Methods – II**

Time: 3 hrs.

Max. Marks:100

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

**1 a. Give any three characteristics of a good model. (03 Marks)**

**b. Solve the following by graphical method:**

$$\text{Maximize } Z = 2x + 3y$$

Subject to constraints

$$x + y \leq 30$$

$$y \geq 3$$

$$0 \leq y \leq 12$$

$$x - y \geq 0$$

$$0 \leq x \leq 20$$

$$x, y \geq 0 \rightarrow \text{non-negative constraints. (07 Marks)}$$

**c. Sachin an agriculturist has a 100 acre farm. He sells all tomatoes, lettuce heads or radishes and gets a price of ₹1.00 per kg for tomatoes, ₹0.75 per lettuce head and ₹2.00 per kg for radishes. The average yield per acre is 2,000kg of tomatoes, 3,000 heads of lettuce and 1,000kg of radishes. Fertilizers are available at ₹0.50 per kg and the amount required per acre is 100kg each for tomatoes and lettuce and 50kg for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man-days each for tomatoes and radishes and 6 man days for lettuce. A total of 400 man-days of labour is available at ₹20 per man day. Formulate this as a linear programming model to maximize the agriculturist's total profit. (10 Marks)**

**2 a. What is degeneracy in transportation problem? (03 Marks)**

**b. List the steps involved in methodology of operations research with brief explanation. (07 Marks)**

**c. Solve the following transportation problem by Vogel's approximation method and check for optimality:**

		DESTINATION				SUPPLY
		P	Q	R	S	
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

(10 Marks)

**3 a. Define opportunity loss table. (03 Marks)**

**b. Operation research approach to decision making is based on three phases. List and explain them. (07 Marks)**

- c. Prakash the owner of a small machine shop has four mechanics available to assign jobs for the day. Five jobs are offered with expected profit for each mechanic on each job. Which are as follows:

Mechanic	Job				
	A	B	C	D	E
1	62	78	50	111	82
2	71	84	61	73	59
3	87	92	111	71	81
4	48	64	87	77	80

By using the assignment method, find the assignment of mechanics to the job that will result in maximum profit. Which job should be declined? (10 Marks)

- 4 a. Define payoff matrix in game theory. (03 Marks)  
 b. The estimated sales of proposed types of perfumes are as under:

Types of perfumes	Estimated level of sales (units)		
	I	II	III
A	25	15	10
B	40	20	5
C	60	25	3

What will be the best alternative if Sanjana adopts the Laplace criterion? (07 Marks)

- c. We have five jobs, each of which must go through the machines A, B and C in the order ABC. Determine the sequence that will minimize the total elapsed time:

Job No.	J1	J2	J3	J4	J5
Machine A	5	7	6	9	5
Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

(10 Marks)

- 5 a. Give any three advantages of simulation. (03 Marks)  
 b. In a game of matching coins with two players, suppose A wins one unit of value when there are two heads, wins nothing when there are two tails and losses 1/2 unit of value when there are one head and one tail. Determine the pay-off matrix, the best strategies for each player and the value of the game. (07 Marks)  
 c. Solve the  $6 \times 2$  game problem graphically

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{bmatrix}$$

(10 Marks)

- 6 a. What does (M/M/1) : ( $\infty$ /FCFS) represent in queuing theory? (03 Marks)  
 b. A T.V. mechanic finds that the time spent on his jobs has an exponential distribution with mean 30 minutes, if he repairs sets in the orders in which they come in. If the arrival of sets in the order in which they come is approximately poisson with an average rate of 10 per eight-hour day. What is the mechanics expected idle time each day? How many jobs are ahead of the average set just brought in? (07 Marks)

- c. A tourist car operator finds that during the past few months, the car's use has varied so much that the cost of maintaining the car varied considerably. During the past 200 days the demand for the car fluctuated as below:

Trips per week	Frequency probability
0	16
1	24
2	30
3	60
4	40
5	30

Use the random numbers 82, 96, 18, 96, 20, 84, 56, 11, 52 and 03 as the demand for each week. Simulate the demand for a 10-week period. (10 Marks)

- 7 a. Obtain the dual of the following primal LP problem:

Maximize  $Z = x_1 + 2x_2 + x_3$

Subject to  $2x_1 + x_2 - x_3 \leq 2$

$-2x_1 + x_2 + 5x_3 \geq -6$

$4x_1 + x_2 + x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

(05 Marks)

- b. How do restrictions arise in assigning the jobs? Justify your answer with an example.

(05 Marks)

- c. For what value of  $\lambda$ , the game with following pay-off matrix is strictly determinable?

(05 Marks)

PLAYER 'A'		PLAYER 'B'		
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
	A <sub>1</sub>	$\lambda$	6	2
	A <sub>2</sub>	-1	$\lambda$	-7
	A <sub>3</sub>	-2	4	$\lambda$

- d. For a standard normal variable  $z$ ,  $p(0 \leq z \leq 1) = 0.3413$ , if the expected duration of a project is 40 days and the standard deviation of the critical path is 5 days, what is the probability of completing the project in 35 days? (05 Marks)

- 8 Tasks A, B, ..., H, I constitute a project. The notation  $X < Y$  means that the task X must be completed before Y is started. With the notation.  $A < D, A < E, B < F, D < F, C < G, C < H, F < I, G < I$ . Draw a network to represent the sequence of tasks and find the minimum time of completion of the project, when the time (in days) of completion of each task as follows:

Task	A	B	C	D	E	F	G	H	I
Time (days)	8	10	8	10	16	17	18	14	9

Also obtain the three floats.

(20 Marks)

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