Second Semester MBA Degree Examination, June/July 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.　State the characteristics of operation research. 　　　　　　　　　　(03 Marks)
　　b.　Briefly describe modeling process in OR. 　　　　　　　　　　　　(07 Marks)
　　c.　Solve the LP problem by using graphical method:
　　　　Minimize $Z = 20x_1 + 10x_2$
　　　　Subject to 　$x_1 + 2x_2 \leq 40$
　　　　　　　　　　$3x_1 + x_2 \geq 30$
　　　　　　　　　　$4x_1 + 3x_2 \geq 60$
　　　　　　　　　　$x_1, x_2 \geq 0$ 　　　　　　　　　　　　　　　　　(10 Marks)

2　a.　What are the three components of LP model? 　　　　　　　　　　(03 Marks)
　　b.　An investor is considering three options　i) To open a small retail shop;　ii) Open a supermarket　or　iii) Not to open any shop at all. The market for the product the investor plans to sell can be good, average or bad. The probabilities of these three possibilities are 0.3 for good market, 0.5 for an average market and 0.2 for a bad market. The pay offs (net profit or loss) for the three options are given as below. What do you recommend to the investor? 　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(07 Marks)

<div align="center">State of Nature</div>

Decision alternatives	Good market	Average market	Bad market
1.　Small retail shop	60,000	25,000	-40,000
2.　Supermarket	90,000	35,000	-50,000
3.　No shop	0	0	0

　　c.　Solve the transportation problem given below:

<div align="center">Ware Houses</div>

Plants	W_1	W_2	W_3	W_4	Supply
P_1	6	2	6	12	120
P_2	4	4	2	4	200
P_3	13	8	7	2	80
Demand	50	80	90	180	400

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(10 Marks)

3　a.　State the assumptions of job sequencing model. 　　　　　　　　　(03 Marks)
　　b.　Solve the following assignment problem: 　　　　　　　　　　　(07 Marks)

<div align="center">Machine</div>

		M_1	M_2	M_3
Job	J_1	9	12	15
	J_2	8	10	17
	J_3	14	9	11

c. Solve the following game using graphical method:

$$\begin{array}{c} & B_1 & B_2 \\ A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \end{array} \begin{bmatrix} -6 & 7 \\ 4 & -5 \\ -1 & -2 \\ -2 & 5 \\ 7 & -6 \end{bmatrix}$$

(10 Marks)

4 a. What do you mean by simulation? (03 Marks)
   b. Briefly explain general structure of queuing system and give two examples of queuing situation. (07 Marks)
   c. The arrivals at an ATM booth are assumed to be exponentially distributed. The arrival rate is 4 per hour and service rate is 12 per hour. Determine:
      i)   Average number of customers in the system.
      ii)   Average time a customer spends in the system.
      iii) Average queue length.
      iv)   Average waiting time of a customer before being served. (10 Marks)

5 a. Define terms:
      i)   Pure strategy
      ii)   Optimal strategy
      iii) Mixed strategy. (03 Marks)
   b. Distinguish between CPM and PERT technique. (07 Marks)
   c. Five jobs have to be processed through 3 machines M_1, M_2 and M_3 in the order $M1 \rightarrow M_2 \rightarrow M_3$. The time taken to process the jobs are given below. Determine the minimum total elapsed time and total idle time on each machine. (10 Marks)

Jobs	M_1	M_2	M_3
J_1	9	6	5
J_2	10	7	10
J_3	7	4	8
J_4	8	3	7
J_5	12	5	6

6 a. What do you mean by degeneracy? (03 Marks)
   b. Draw a network diagram for the given activities below and determine critical path. (07 Marks)

Activity	A	B	C	D	E	F	G	H	I	J
Immediate predecessor activity	-	A	A	A	B	C	C	E, F	D, G	H, I
Duration	12	8	4	3	12	18	5	4	9	6

   c. HPM Co. maintain a stock of 100 litre geysers that it sells to house holds and installs them. The marketing manager examines the sales of geysers over past 50 weeks and observe the following:

Geyser sales/week	Number of weeks
4	6
5	5
6	9
7	12
8	8
9	7
10	3
	50 weeks

(Random numbers: 10, 24, 03, 32, 23, 59, 95, 34, 34, 51).

If a co. maintains a constant supply of 8 geysers in any given week. How many times it will be out of stock during 10 weeks simulated period and what is the average number of sales per week? **(10 Marks)**

7 a. "Assignment model is a particular case of transportation model" explain in brief. **(05 Marks)**

b. Give five applications of operation research in real life situations. **(05 Marks)**

c. In a factory there are six jobs to perform each of which would go through two m/c A and B. In the order AB. The processing times (in hours) for the jobs are given below. You are required to determine the optimal sequence for performing jobs and minimum total elapsed time. **(05 Marks)**

Job	1	2	3	4	5	6
M/c A	7	4	2	5	9	8
M/c B	3	8	6	6	4	1

d. If A's strategy is (1/2, 1/2) and value of game is 5/2. Find the value of 'q' and probability of B from the following game. $\begin{bmatrix} 3 & q \\ 2 & 6 \end{bmatrix}$. **(05 Marks)**

8 a. Obtain the dual of the LPP given below:

Maximize $Z = 8x_1 + 12x_2 + 6x_3$

Subject to $x_1 - x_3 \le 5$

$2x_1 + 4x_2 \le 12$

$x_1 + x_2 + x_3 \ge 2$

$3x_1 + 2x_2 - x_3 = 7$

$x_1, x_2, x_3 \ge 0$. **(10 Marks)**

b. The time estimation (in weeks) for the activities of a PERT network are given below.

Activity	t_m	t_o	t_p
1 – 2	1	1	7
1 – 3	4	1	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	5	2	14
4 – 6	5	2	8
5 – 6	6	3	15

i) Draw the network and determine critical path.

ii) What is the probability that the project will be completed at least 4 week earlier than expected time? (For $Z = -1.33$ $P = 0.0918$). **(10 Marks)**

* * * * *