Second Semester MBA Degree Examination, Dec.2013/Jan.2014
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 Q.No.8 are compulsory.
3. Use of statistical tables permitted.

1 a. What is degeneracy of transportation problem? **(03 Marks)**

b. Write the dual of the following LPP.
Maximize $Z = 3x_1 + 4x_2 + 7x_3$
Subject to, $x_1 + x_2 + x_3 \leq 10$
$4x_1 + x_2 - x_3 \geq 15$
$x_1 + x_2 + x_3 = 7$; $x_1, x_2 \geq 0$, x_3 unrestricted. **(07 Marks)**

c. A stockiest of a particular commodity makes a profit of ` 30 on each sale made within the same week of purchase, otherwise he incurs a loss of ` 30 on each item. The data on the past data are given below:

No. of items sold within the same week	5	6	7	8	9	10	11
Frequency	0	9	12	24	9	6	0

(i) Find out the optimum member of items the stockiest should buy every week in order to maximize the profit.
(ii) Calculate the expected value of perfect information. **(10 Marks)**

2 a. Define Operations Research. **(03 Marks)**

b. Solve the following game using graphical approach: **(07 Marks)**

		B's strategy			
		b₁	b₂	b₃	b₄
A's strategy	a₁	8	5	-7	9
	a₂	-6	6	4	-2

c. A company manufactures 30 units/day. The sale of these items depends upon demand which has the following distribution.

Sales (units)	Probability
27	0.10
28	0.15
29	0.20
30	0.35
31	0.15
32	0.05

The production cost and sale price of each unit are ` 40 and ` 50 respectively. Any unsold product is to be disposed off at a loss of ` 15 per unit. There is a penalty of ` 5 per unit if the demand is not met using the following random numbers, estimate the total profit/loss for the company for the next 10 days.
10, 99, 65, 99, 95, 01, 79, 11, 16, 20
If the company decides to produce 29 units per day, what is the advantage or disadvantage of the company? **(10 Marks)**

3 a. What is the redundant constraint? **(03 Marks)**

b. Explain the steps followed in solving the operations research problems. **(07 Marks)**

c. A typist at an office receives, on an average 22 letters per day of typing. The typist works 8 hours a day and it takes on an average 20 minutes to type a letter. The company has determined that the cost of a letter waiting to be mailed (opportunity cost) is 80 paise per hour and the equipment operating cost plus salary of the typist will be `40 per day.
   (i) What is the typists utilization rate?
   (ii) What is the average number of letters waiting to be typed?
   (iii) What is the average waiting time needed to have a letter typed?
   (iv) What is the total cost of waiting letters to be mailed? **(10 Marks)**

4 a. Give a general structure of queuing system and explain. Illustrate some queuing situations. **(05 Marks)**

b. Find the sequence that minimizes the total elapsed time required to complete the following jobs on machines M_1, M_2 and M_3 in the order M_1, M_2 and M_3. **(05 Marks)**

Job	A	B	C	D	E	F
M_1	8	3	7	2	5	1
M_2	3	4	5	2	1	6
M_3	8	7	6	9	10	9

c. Consider the following game and solve by algebraic method. **(10 Marks)**

Player B

		1	2	3
Player A	1	3	1	4
	2	6	7	-2

5 a. What are the steps/phases in simulation? Explain. **(05 Marks)**

b. Explain the operating characteristics of queuing system. **(05 Marks)**

c. A small project consists of seven activities which are given below:

Activity	Duration			
	Most Likely	Optimistic	Pessimistic	Immediate Predecessor
A	3	1	7	-
B	6	2	14	A
C	3	3	3	A
D	10	4	22	B, C
E	7	3	15	B
F	5	2	14	D, E
G	4	4	4	D

(i) Draw the network, number of nodes, find the critical path, expected project completion time and the next most critical path.

(ii) What project duration will have 95% confidence of competition? **(10 Marks)**

6 a. Find the initial feasible solution of the following transportation problem by least cost method. **(05 Marks)**

	W_1	W_2	W_3	Suppliers
F_1	48	60	56	140
F_2	45	55	53	260
F_3	50	65	60	360
F_4	52	64	55	220
Demand	200	320	250	

b. A small maintenance project consists of following jobs whose precedence relations are identified with their nodes numbers:

Activity	Duration (days)
1 – 2	2
1 – 3	4
1 – 4	3
2 – 5	1
3 – 5	6
4 – 6	5
5 – 6	7

Required:
(i)   Draw project network.
(ii) Find the critical path and total project duration.
(iii) Find the earliest and latest start time and earliest and latest finish time.
(iv) Find total float, free float and independent float. **(15 Marks)**

7 a. There are 4 plants with capacity 100, 150, 200, 50 units and 4 warehouses with demand 50, 150, 100, 100. The marketing manager is assigning new MBA graduate joined to use TPM model. Without altering the data is it possible to apply transportation model? Why? **(05 Marks)**

b. A social entrepreneur is helping 2 persons who are playing a game. Player A and Player B are under assumption that the loss of one person will be a benefit to social entrepreneur? How do you convince the player? **(05 Marks)**

c. Three operators are to be assigned to three machines based on the operational time. Supervisor suggest to use OR techniques, whereas operator wants experience base. Who is correct? Why? **(05 Marks)**

d. Customers in a bank always complaint about delay in service extended. Bank manager has a problem of resource for appointing more employees. IF you are consultant, how do you suggest an optimal solution? **(05 Marks)**

8 Assume you have inherited `100000 from your father in law that can be invested in a combination of only two stock portfolios, with the maximum investment allowed in either portfolio set at `75000. The first portfolio has an average return of 10%, whereas the second has 20%, in terms of risk factors associated with these portfolios, the first has a rating of 4 (on a scale from 0 to 10), and the second has 9. Since you want to maximize your return, you will not accept an average rate of return below 12% or a risk factor above 6. Hence, you then face the important question, how much you invest in each portfolio. You are required to:
(i) Formulate this as a linear programming problem.   (ii) Solve it by graphical method. **(20 Marks)**

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