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**Second Semester MBA Degree Examination, June / July 2014**  
**Quantitative Methods - II**

Time: 3 hrs.

Max. Marks: 100

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

- 1**
- What are the limitations of a linear programming problem (LPP)? (03 Marks)
  - With a flow chart, state the steps involved in the solution of an Operations Research (OR) problem. (07 Marks)
  - Explain various models of Operation Research, with suitable examples. (10 Marks)
- 2**
- Explain two person zero sum game with an example. (03 Marks)
  - Write the dual of the following LPP.  
Minimize  $Z = 2x_1 + 5x_2 - 9x_3$   
Subject to  $3x_1 - 7x_2 + x_3 \geq 8$   
 $9x_1 - 4x_2 \leq 10$   
 $x_1 + x_2 - 2x_3 = 15$   
 $4x_2 + 6x_3 \geq 16$   
 $x_1 \geq 0, x_2 - \text{unconstrained}, x_3 \geq 0.$  (07 Marks)
  - A machine operator has to perform three operations : turning threading and knurling on a number of different jobs. The time required to perform these operations (in minutes) for each job is given below :

Job	A	B	C	D	E	F
Time for Turning	3	12	5	2	9	11
Time for Threading	8	6	4	6	3	1
Time for Knurling	13	14	9	12	8	13

Determine the order in which the jobs should be processed in order to complete all jobs in minimum time. Also find the idle time for all operations. (10 Marks)

- 3**
- What is Simulation? Explain with an example. (03 Marks)
  - The following table gives the cost per hour in Rs for performing different tasks by 4 men. Assign them to different tasks to minimize total cost. (07 Marks)

Task \ Men	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

- c.** Use graphical method to obtain the optimal strategies for both players and value of the game for two person zero sum game whose payoff matrix is given as follows : (10 Marks)

Player B

Player A	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
A <sub>1</sub>	2	4	12	10
A <sub>2</sub>	9	6	3	5

- 4**
- What are objective function, decision variables and constraints with reference to LPP? (05 Marks)

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.

- b. List out the differences between PERT and CPM. (05 Marks)
- c. A self service store employs one cashier at its corner. Nine customers arrive on an average every 5 minutes while cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution of arrival rate and exponential distribution of service time, find
- The average queue length.
  - Average number of customers at the store.
  - Average waiting time of a customer in queue.
  - Average time a customer spends at the store.
  - The probability that a customer will spend more than 10 minutes at the store. (10 Marks)
- 5 a. Illustrate Merge and Burst events. (05 Marks)
- b. The marketing staff of an Industrial organization has submitted the following payoff table (giving profits in million of rupees) concerning certain proposal depending upon the rate of technological advance.
- | Technological Advance | Decision |        |
|-----------------------|----------|--------|
|                       | Accept   | Reject |
| Much                  | 2        | 3      |
| Little                | 5        | 2      |
| None                  | -1       | 4      |
- The probabilities are 0.2, 0.5 and 0.3 for much, little and none technological advance. What decision should be taken? (05 Marks)
- c. Solve the following LPP graphically :
- Minimize  $Z = 20x + 40y$   
 Subject to  $x + 3y \geq 40$   
 $x + 2y \leq 35$   
 $x + y \geq 20$   
 $x, y \geq 0$ . (10 Marks)
- 6 a. Describe the general structure of the queuing system. (05 Marks)
- b. A project consists of the following activities :
- | Activity        | 1-2 | 1-3 | 1-4 | 2-3 | 2-6 | 3-5 | 3-6 | 4-5 | 5-6 |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration (days) | 3   | 4   | 14  | 10  | 5   | 4   | 6   | 1   | 1   |
- Draw project network.
  - Find the critical path and total project duration.
  - Find the earliest and latest start time and earliest and latest finish time.
  - Find total float, free float and independent float. (15 Marks)
- 7 a. Two firms are competing for market share of a particular product. Each firm is considering different promotional strategies to employ for the coming period. How should they decide? (05 Marks)
- b. You have inherited Rs 50 lakhs from your grand father. You have several investment options. The return on investment depends on whether the economy experiences inflation, recession or no change at all. How should you decide? (05 Marks)
- c. Which O.R technique should be used to enforce the timely completion of METRO Rail project in Bangalore? Explain (05 Marks)
- d. How to allocate different salesmen to different territories if their average sales in different territories is known from past records. (05 Marks)
- 8 a. The management of a company is considering the marketing of a new product with a fixed cost of Rs 25,000. The selling price (Rs), variable cost (Rs) and the annual sales volume (units) are uncertain with following distribution :

Selling Price (Rs)	Probability	Variable cost (Rs)	Probability	Sales volume	Probability
40	0.30	20	0.10	3000	0.20
50	0.50	30	0.60	4000	0.40
60	0.20	40	0.30	5000	0.40

Using Monte Carlo simulation technique, determine the average profit for 8 trials using the following random numbers : (10 Marks)

Price :	81	04	67	10	39	89	12	31
Cost :	32	46	25	40	68	66	64	86
Volume :	60	31	24	02	08	90	79	68

- b. A company has three refineries P, Q and R with production of 130, 150 and 170 metric tons respectively. It has four depot A, B, C and D with requirement of 90, 100, 140 and 120 metric tons respectively. The transportation cost per metric ton in hundreds of rupees is as follows :

Refinery	Depot			
	A	B	C	D
P	10	12	15	8
Q	11	11	9	10
R	20	9	7	18

Find the optimal distribution for minimum total transportation cost. Is the solution unique? If not find all optimal solutions. (10 Marks)

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