DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

CEL 772: QUANTITAVE METHODS IN CONSTRUCTION MANAGEMENT

MAJOR TEST (FIRST SEMESTER 2013-14)

Date: 26th November 2013
Time: 08:00 – 10:00 AM

Venue: V-LT1
Max Marks: 40

NOTE:

1. **CELL PHONES ARE NOT ALLOWED EVEN IN SWITCHED OFF MODE. KEEP IT AWAY FROM YOU EITHER IN YOUR BAG OR HAND IT OVER TO THE INVIGILATOR DUIRING EXAMINATION.**
2. **USE YOUR OWN CALCULATOR. EXCHANGE OF CALCULATORS IS NOT ALLOWED.**
3. **ANSWER ALL QUESTIONS.**

1. Ram Prasad has a newspaper stand where he sells papers for ₹ 5. The papers cost him ₹ 3, giving him a ₹ 2 profit on each one he sells. From past experience, Ram Prasad knows that

   20% of the time he sells 100 papers
   20% of the time he sells 150 papers
   30% of the time he sells 200 papers
   30% of the time he sells 250 papers

   Assuming that Ram Prasad believes that the cost of a lost sale (i.e., due to shortage) is ₹ 1 and any unsold papers cost him ₹ 3, simulate Ram Prasad's profit outlook over 20 days if he orders 200 papers for each of the 20 days (i.e., calculate his average profit or loss in these twenty days). Use the following random numbers: 52, 70, 05, 48, 34, 15, 33, 59, 05, 28, 85, 13, 99, 24, 44, 41, 10, 76, 47, 91.

   8 marks

2. The new Providence shopping mall has been considering setting up an information desk manned by one employee. The layout for this mall is quite complex, leading the mall manager to expect a higher than normal arrival rate for persons seeking assistance. It appears that a reasonable expectation is an arrival rate of approximately 25 patrons per hour. Under the original plan, the manager expected that it would take approximately 4 minutes for the Information Desk employee to help the average person. He has now come to realize that employing only a single person at the information desk would lead to a very lengthy line – theoretically, an infinite line! He has decided, therefore, to employ two staff members at the information desk.

   (a) Find the proportion of the time that the employees are busy.
   (b) Find the average number of people waiting in line to get some information.
   (c) Find the expected time a person spends just waiting in line to have his question answered.
   (d) If the manager has a goal that, for the average patron, the time spent having one's question answered is less than half the time spent waiting, has he met that goal?
   (e) Assuming that the manager also has the goal that the combined idle time for the two workers does not exceed 45 minutes in an 8 hour day has he met that goal?
   (f) What would the arrival rate have to be for the manager to meet the 45 minute idle time goal?

3. Allied Manufacturing has three factories located in Mumbai, Delhi and Pune. They each produce the same product and ship to three regional warehouses #1, #2, and #3. The cost of shipping in rupees hundred one unit of each product to each of the three destinations is given in the table below.

	TO==>	#1	#2	#3	SUPPLY
FROM	Mumbai	4	6	5	100
	Delhi	5	7	8	100
	Pune	4	3	5	100
	DEMAND	120	130	150	

There is no way to meet the demand for each warehouse. Therefore, the company has decided to set the following goals: (1) each source should ship as much of its capacity as possible, (2) the number shipped to each destination should be as close to the demand as possible, (3) the capacity of Pune should be divided as evenly as possible between warehouses #1 and #2, and (4) the total cost should be less than ₹ 1,40,000. Formulate this as a goal programming problem.

8 marks

4. The purchasing manager for a firm is trying to determine what the safety stock should be for a particular product. She has developed the following table, which gives the distribution of demand during the lead time and the probabilities:

Demand During Lead Time	Probability
40	0.10
50	0.20
60	0.25
70	0.25
80	0.20

The carrying cost is ₹ 50 per unit per year, the ordering cost is ₹ 300 per order, and the stock out cost is ₹ 400 per unit. The reorder point is 60 units, and 6 orders are placed each year. What level of safety stock should be maintained? (Note: Reorder point is the inventory level when the new order is placed.)

8 mark

5. Before a market survey is done, there is a 50/50 chance that a new project would be a succes The people doing the survey have determined that there is a 0.8 probability that the survey w be favorable given a successful store. There is also a 0.7 probability that the survey will unfavorable given an unsuccessful store. What is the probability that the survey will unfavorable?