NORTHEASTERN UNIVERSITY
Department of Mechanical and Industrial Engineering

Supply Chain Engineering **Prof. Gupta**
IE 7200 **Spring 2014 (Mondays)**

Homework No. 2
(Due: February 3, 2014)

Problem 1. Consider the model

$$Y(t) = a(10)^{bt}$$

Using an appropriate linear transform, derive equations to allow the determination of *a* and *b* through least squares method.

Problem 2. Consider the following data:

t	1	2	3	4	5	6
Y(t)	8	12	20	32	48	80

Determine *a* and *b* in problem 1's model and forecast Y(8).

Problem 3. Consider the quarterly sales data:

Year	**I**	**II**	**III**	**IV**
1	43	27	10	22
2	49	35	14	27
3	58	47	14	32
4	71	53	18	35
5	80	63	22	41

a. Determine appropriate seasonal indices for each quarter.
b. Use the indices and the time series model in predicting quarter values for year six.

Problem 4. A production line has three production stations, A, B, and C. In-process storage is possible between the stations, but at the monthly cost of $100 for storage between A and B and $150 between B and C. The storage would offset any station downtime in the preceding station(s). Income per item produced is $5 and the maximum monthly production rate is 1000 units. If the downtimes for stations A, B, and C are 5, 3, and 7 percent, respectively, determine the optimum income-cost relationship from the four possible configurations of in-process inventory management. Assume the station downtimes are statistically independent.

Problem 5. A particular product is being evaluated for its economic order quantity. Storage is charged at $2 per unit per month, and this product does not share the particular storage facility with any other product. Purchase order cost is $85, interest rate is 25 percent per year, and capital cost of the product is $200. The demand rate for the product is 3000 units per year. Determine the EOQ value.

Problem 6. Determine the total annual inventory cost for the product in the previous problem.

Problem 7. At what time intervals should the product of the previous problem be reviewed for reorder purposes.

Problem 8. Reevaluate the EOQ, total annual inventory cost, and the ordering time interval, if the product in the previous problem is now one of many that use the same general storage area.

Problem 9. In an attempt to establish an ABC classification, a firm wants to analyze its inventory of 5000 items. Following is a random sample of 20 of their items:

Item Number	Annual Usage ($)	Item Number	Annual Usage ($)
1	1500	11	13000
2	12000	12	600
3	2200	13	42000
4	50000	14	9900
5	9600	15	1200
6	750	16	10200
7	2000	17	4000
8	11000	18	61000
9	800	19	3500
10	15000	20	2900

Following the usual guidelines for ABC breakdown, indicate the items which will be classified in each category and find the percentage of value for each classification.