UNIVERSITY OF TORONTO

FACULTY OF APPLIED SCIENCE AND ENGINEERING

FINAL EXAMINATION, APRIL 2001

MIE363H1S - RESOURCE AND PRODUCTION MODELING

Exam Type: B

Examiner: D.M. Frances

A sheet of Formulas and a Normal Distribution table are provided.
Unless otherwise noted, all facts provided about the XYZ Company apply to all of the questions.

15
1. As a consultant to the XYZ Company you have been asked to advise the firm about its inventory policy. The period of interest is 4 months starting 2-months hence. You have been informed that the forecast demand over these months is 50, 60, 65, and 45 units.

    a. Should XYZ use an EOQ policy? Explain.

    b. Assuming that an EOQ policy is appropriate
        i. What is the optimal EOQ policy?
        ii. What is the total set-up cost over the period?
        iii. What is the total holding cost over the period?

Additional facts about XYZ: Each production runs take 2 months, regardless of the size of the run, and costs $225 to set-up. The holding cost is 0.50 $/unit/month. No backlogs are permitted. Each lost sale costs XYZ $1.20 per unit.

15
2. Assuming that an EOQ policy is not appropriate, determine the production schedule for the following lot-sizing policies:
    a. Lot-for-lot.
    b. Periodic Order Quantity Method.
    c. Part Period Balancing Method.
    d. Silver Meal

30
3. After further discussion with the XYZ management team, you learn that the demand forecast is simply the actual historical demand from the previous year. The consensus is that the numbers are just random and independent variations in demand, with no identifiable underlying explanation. It is agreed to regard these as equally likely forecasts for any month in the foreseeable future. Derive and explain the following policies.
    a. Assuming single unit sales, the optimal (r, q) policy?
    b. Assuming bulk sales, the optimal (s, S) policy?
    c. Assuming that XYZ only determines its inventory on a periodic basis at a cost of $200 per inventory, the optimal (R, S) policy. Note: For this part, you may assume that the required distribution is normal.

20   4. One of XYZ's strategies for reducing the processing time is to review the manufacturing scheduling policy. One unit is assembled from 10 subcomponents, labelled A to J. You are asked to advise the company on the optimal order for processing these subcomponents. The current order for processing the sub-components, along with the processing times on each machine are shown below.

        a. How long will it take to process the subcomponents using the current order?
        b. What is the largest % reduction XYZ can attain by changing the order?

| | Processing times in minutes | |
Sub-component	m/c #1	m/c #2
C	8	5
F	15	10
B	6	5
A	5	10
G	17	15
I	10	10
D	5	3
H	4	15
E	12	10
J	20	3

20   5. Currently XYZ's production scheduling decisions are totally insensitive to its manpower sourcing and wage rates. XYZ is looking into a more aggregate planning process to merge its production scheduling decisions with its manpower situation. The HR department has determined that one unit of XYZ requires on average 40 person-hrs. The XYZ work force consists of 10 employees, each of which works 180 hrs per month, earns 25 $/hr, and can work an additional 40 hours/month on overtime at 30 $/hr. In addition XYZ has unlimited access to external labour at 40 $/hr. Assuming the demand forecast is as provided in question #1, formulate a Linear Programming model to minimize the overall production and holding cost over the four month period. Note: Assume the set-up cost has been eliminated.