

IE459: Homework 2

Due Wednesday December 7, 2011

2.1 (20 points) Consider the product structure, where there are five stages and links $5 \rightarrow 2$, $2 \rightarrow 1$, $4 \rightarrow 2$, $4 \rightarrow 3$, and $3 \rightarrow 1$. Assume that $r_{52} = 2$, $r_{21} = 1$, $r_{42} = 3$, $r_{43} = 2$, and $r_{31} = 4$. Suppose the installation inventory levels and costs are as in Table 1.

a) Find the echelon costs and echelon inventory levels for each stage.

b) Show that total installation inventory costs and total echelon inventory costs are the same here.

Table 1: Data for Problem 2.3

Stage	1	2	3	4	5
Installation level	25	10	5	45	60
Installation cost	\$70	\$20	\$12	\$5	\$1

2.2 (20 points) Consider product B composed by one part C, one part E, while C is made from 4 part F and 1 part G, E is assembled by 2 F and 2 H. The lead times of E, F and G are one week, while C and H are two weeks. The master production schedule for planned assemblies over the next 10 weeks for product B is as follows: 0, 0, 300, 0, 250, 125, 125, 0, 400, and 275. Current on-hand inventory levels are 500 parts of type H, 350 part Fs, and 150 parts of type G. In addition, an order for 200 parts Cs is in process and should be completed in time for use in period 1. Plan order releases for all items using lot-for-lot scheduling.

2.3 (20 points) A firm has order leadtime $L = 1$ days and it faces a Poisson demand with a rate $\lambda = 6$ items per day. Its inventory cost rate is $h = 2$ dollars per item per day and backlogging cost rate is $b = 2$ dollars per item per day. The firm adopts a base-stock policy with base level $s = 5$. Evaluate the firm's average daily inventory cost.

2.4 (20 points) Let $f(x) = x^3 + 2x$, $x \in (0, +\infty)$. Show that $f(x)$ is convex.

2.5 (20 points) Consider the data in Table 2 for a single-machine problem. Find the optimal sequence that minimizes NT using the Moore and Hodgson Algorithm.

Table 2: Job Data for Problem 2.5

Job	Processing time	Due time
1	2	5
2	5	10
3	4	13
4	6	15
5	3	18
6	5	20
7	4	20