PRACTICE PROBLEMS FOR SECOND MIDTERM

1. The Acme Corporation sells socks. The table below gives the demand for men's baseball socks (in thousands of pairs) during the past two years:

	2005	2006
First half	55	64
Second half	49	56

(a) The seasonal factors are 1.1 and 0.9 in the first half and second half, respectively. What are your forecasts for the first and second halves of 2007?

(a') For a more challenging version of the problem, suppose that you don't know the seasonal factors, and answer the question accordingly.

(b) How would you define the time periods if you were setting up a forecasting system for this line of products? What would you expect the seasonal factors to be for your seasons? What values of the smoothing constants would you use and why?

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2. A lawnmower repair shop in southern Illinois tries to forecast the date of the last snowfall because many customers bring their mowers into the shop for tune-ups shortly after they are convinced the last snowfall has occurred. The available dates of the last snowfalls are given below (number of days after the beginning of the year):

1997 107
1998 103
1999 86
2000 99.
2001 92
2002 98
2003 99
2004 The last snowfall occurred in May.
2005 80
2006 75

(a) The shop has been using simple exponential smoothing with $\alpha = 0.2$. Should they call the National Weather Service to find out exactly when the last snowfall occurred in 2004? Support your answer with some type of numerical analysis.

(b) Suppose that at the end of 2001, the smoothed error was 4.0 and MAD was 5.0. The forecast for 2002 was 98. The company has been using a tracking signal since 1998. Would your tracking signal be "out of control" if the last snowfall in 2004 happened to occur on May 31?

3. Fill in the blanks in the table below:

		Period 1	2	3	4	5	6	7
Gross Requirements		80	100	0		50		90
Scheduled Receipts		0		0	70	110	0	90
On Hand Inventory	80		0	0		20		0
Planned Orders		70						

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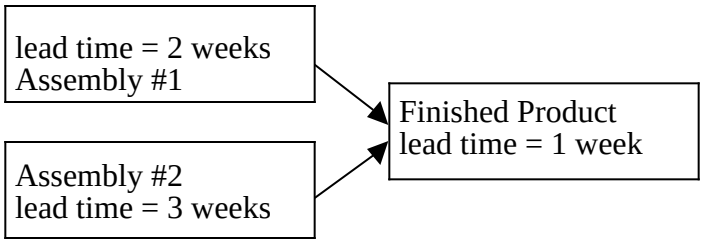
4. You have been given the following product structure diagram:



The finished product costs $5.00 per week to hold in inventory and the setup cost for a production run is $1000. Assembly #1 is subject to engineering changes that occur approximately once a month. It costs $1.00 per week to hold in inventory and has a setup cost of $50 for a production run. Both departments try to minimize setup and inventory holding costs. Fill in the tables below. Show supporting analysis where applicable.

	Week 1	2	3	4	5	6
Finished Product						
Gross Requirements	100	80	100	120	80	100
Scheduled Receipts						
On-Hand Inventory 100						
Planned Orders						
Assembly #1						
Gross Requirements						
Scheduled Receipts		100				
On-Hand Inventory 200						
Planned Orders						

5. A sewing factory specializes in making school uniforms. The work is arranged in a similar manner to that described in the Jos. A. Bank Clothiers "Tour" in the Schmenner book. (The main difference is that school uniforms are much simpler and each piece requires only a few steps.) Each item (e.g., shirt, pants, skirt) takes about 15 minutes of labor time and costs about $7.50 for materials. Employees are paid $10.00 per hour, including benefits, and full-time employees work 40 hours per week. Any hours beyond 40 per week must be paid at 150% of regular time, and any hours beyond 12 hours per day must be paid at 200% of regular time. New employees spend one week in training and are unproductive during that time. Employees who are fired are provided 2 weeks' severance pay. The factory has enough space for about 60 employees. The company uses an annual inventory holding cost rate of 40%. The following demands (in pieces) are anticipated in 2007:

First quarter	200,000
Second quarter	100,000
Third quarter	400,000
Fourth quarter	150,000

(a) Suggest a good aggregate production plan and justify it.

(b) Formulate the production and workforce planning problem as a linear program. For this part of the question, you may assume that demand is only 300,000 in Q3 and 100,000 in Q4. Also, only two shifts are permitted.

(c) Discuss the pros and cons of using a kanban system in this type of situation.

6. A friend of yours is the production manager at a metal stamping plant. She is trying to find a good production schedule for a part that has a setup cost of $1000, and costs $2 to hold in inventory for one month. She has orders as follows:

Dec	Jan	Feb	Mar	April	May
500	200	100	250	400	200

Your friend now tells you that the orders for May are tentative, and some customers might cancel or reduce their orders. Find a good production schedule in view of the uncertainty about the May orders. Would this schedule be optimal if the May demands turn out to be 200, as originally forecasted?