1. (25%) A factory is developing a new product. To produce this new product, a capacity alternative (A) is formed. Under alternative A, there would be a fixed cost of $600 per month and a variable cost of $30 per unit.

   (a) (10%) If it is estimated that 50 units of this product can be sold per month, and a profit target is $650 per month, what price should the factory charge for a unit of this product?

   (b) (15%) A manager proposes another capacity alternative (B) for the same new product. Under alternative B, the fixed cost would be $200 per month and the variable cost would be $40 per unit. If the selling price of this new product is set at $50 per unit, what is the range of quantity that is sold per month where alternative B is more attractive than alternative A?

2. (25%) Seven jobs are to be processed through a single machine. The processing times and due dates are given below.

Job	1	2	3	4	5	6	7
Processing time	3	6	8	4	2	1	7
Due date	4	8	12	15	11	25	21

Determine the sequence of the jobs in order to minimize

   (a) (6%) Mean flow time.
   (b) (6%) Maximum tardiness.
   (c) (6%) Mean lateness.
   (d) (7%) What is the makespan for any sequence?

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3. (25%) Following is the BOM information and inventory records of an end item X.

Item	Amount on Hand	Direct Components
X	0	A(3), B(2), C(4)
A	35	D(2), E(1)
B	12	C(2), F(3)
C	25	
D	60	C(4)
E	40	
F	47	

(a) (10%) Suppose the lot-for-lot lot-sizing rule is applied to all the items. If 20 Xs are needed, how many additional units of item C are required?

(b) (15%) Suppose item A is assembled in multiples of 30 units, item B is assembled in multiples of 20 units, and item D is manufactured in multiples of 15 units. The lot-for-lot rule is applied to the other items. If 20 Xs are needed, how many additional units of item C are required?

4. (25%) A production line consists of five workstations in sequence. Workstation 1 is the first workstation of the line, workstation 2 is the second workstation of the line, and so on. One of the five workstations is the bottleneck of the production line. If the production line operates under PUSH control, which workstation is preferred to be the bottleneck? If the production line operates under PULL control, which workstation is it preferred to be the bottleneck? Why? (You must justify your answer in order to receive credit.)