

School of Engineering
Department of Industrial Engineering

Semester: Fall 2017-18

IENG430 – Inventory Control Final Exam

Date: February 2nd, 2017

Time: 2:00 - 4:00

Student Name: _____ Student ID: _____ Section: A

There are **4 questions** in the booklet; each has several parts. Please answer all parts of the questions to the best of your ability.

Marking Scheme

Questions	Weight	Mark
Question 1	25 pts	
Question 2	25 pts	
Question 3	25 pts	
Question 4	25 pts	
Total	100 points	

- 1. This booklet contains 6 pages including this one. Make sure all these pages are attached.**
- 2. Closed book examination. Formulas are provided as needed.**
- 3. Do not take the staple out. The exam booklet must remain intact.**
- 4. Cheating penalty will be an “F” grade on the exam.**
- 5. Non-programmable calculators are allowed.**
- 6. Mobile phones/devices are to be turned off and stowed away.**
- 7. Students must sign out prior to leaving the exam room.**

In ALL your work, show the calculations

Question I: 25pts

Your company manufactures washing machines. The demand for this has been relatively constant at about 8,000 units each year. The production capacity for this product is 200 units per day. Each time production starts, it costs the company \$120 to move materials into place, reset the assembly line, and clean the equipment. The holding cost of a washing machine is \$50 per year. The current production plan calls for 400 washing machines to be produced in each production run. Assume there are 250 working days per year.

- a-what is the daily demand for this product? 5pts
- b-if the company were to continue to produce 400 units each time production starts, how many days would production continue? 5pts
- c-under the current policy, how many production runs per year would be required? What would the annual setup cost be? 5pts
- d-if the current policy continue, how many washing machines would be in inventory when production stops? What would the average inventory level be? 5pts
- e-if the company produces 400 washing machines at a time, what would the annual setup cost and holding cost be? 5pts

SOLUTION

200

a. daily demand = $d = 8,000/250 = 32$ units

b. number of days of production = $400/200 = 2$ days

c. number of production runs = $D/Q = 8,000/400 = 20$

Total set-up cost = (number of production runs) $C_s = 20(120) = \$2,400$

d. Number in inventory at end of production = $400(1 - d/p) = 400(1 - 32/200) = 336$

This is also the maximum inventory.

Average inventory = $0.5(\text{maximum}) = 0.5(336) = 168$

e. Total holding cost = (average inventory) $C_h = (168)50 = \$8,400$

Total cost = total holding cost + total set-up cost
 $= \$8,400 + \$2,400 = \$10,800$

Question II:25pts

Your company makes office desks. Each desk is made of the following parts: 1 unit of A, 1 unit of B, 1 unit of C. Each C is made up of 2 D, 4 E, and 4 F.

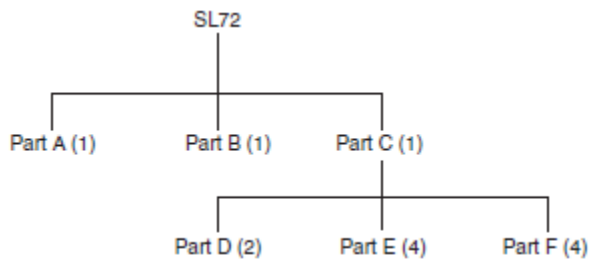
The lead time for each of the parts is one week except for B which is two weeks.

There are currently 150 A, 40 B, 50 C, and 100 F currently in inventory.

The order is for 800 desks in week 4.

- a- Develop a material structure tree for the office desks. 5pts
- b- Develop the MRP: 20pts

SOLUTION



		1	2	3	4	Lead time
SL72	Required Date On-Hand Net Order Receipt Order Release			800	800 0 800 800	1
A	Required Date On-Hand Net Order Receipt Order Release		650	800 150 650 650		1
B	Required Date On-Hand Net Order Receipt Order Release	760		800 40 760 760		2
C	Required Date On-Hand Net Order Receipt Order Release		750	800 50 750 750		1
D	Required Date On-Hand Net Order Receipt Order Release	1500	1500 0 1500 1500			1
E	Required Date On-Hand Net Order Receipt Order Release	3000	3000 0 3000 3000			1
F	Required Date On-Hand Net Order Receipt Order Release	2900	3000 100 2900 2900			1

Question III: 25pts

An industrial engineer from BIU is overburdened with work, and is short of time when it comes to analyzing all the items sold through the warehouse. She gathered some information on the items sold through inventory, along with the unit cost and the demand in units.

Item	Unit cost	Demand (units)
Brush	5.84	1,200
Detergent	5.4	1,110
Deodorant	1.12	896
Silverware	74.54	1,104
Soap	2	1,110
Foam	2.08	961

- a-find the total amount spent on each item during the year. What is the total investment for all of these? 4pts
- b-find the percentage of total investment in inventory that is spent on each item. 4pts
- c-using ABC analysis, which items would be classified as A, B, and C? 4pts
- d-what is your recommendation? 4pts

SOLUTION

a, b.

Code	Total Cost = Unit Cost × Demand	% of Total
XX1	\$7,008	7
B66	\$5,994	6
3CP0	\$1,003.52	1
33CP	\$82,292.16	82
R2D2	\$2,220	2
RMS	\$1,998.88	2
Total cost = \$100,516.56		
70% of total cost = \$70,347.92		

The silverware is A, items brush and detergent are B.

rest is C.

Georges must have strict control over silverware, the rest do not need strict control

Question IV:25pts

Woody Wood Pecker Products offers the following discount schedule for its wood sheets:

Order	Unit cost (\$)
9 sheets or less	18
10 to 50 sheets	17.5
More than 50 sheets	17.25

Khay Company orders wood sheets from WWPP, and has an ordering cost of \$45. The carrying cost is 20%, and the annual demand is 100 sheets.

What do you recommend?

SOLUTION

$$C_o = \$45; I = 20\%; D = 100$$

$$Q_1^* = \sqrt{\frac{2(100)(45)}{0.2(18)}} = 50$$

$$Q_2^* = \sqrt{\frac{2(100)(45)}{0.2(17.50)}} = 50.7$$

$$Q_3^* = \sqrt{\frac{2(100)(45)}{0.2(17.25)}} = 51.1$$

Optimal order quantity would be 51.

$$\begin{aligned} TC &= 100(17.25) + \frac{100(45)}{51} + \frac{51(0.2)(17.25)}{2} \\ &= 1,725 + 88.24 + 87.98 \\ &= \$1,901.22 \end{aligned}$$

Note that

$$tc_1 = 1980$$

$$Tc_2 = 1928$$

$$Tc_3 = 1901 \quad 3^{\text{rd}} \text{ price is chosen}$$

Formulas:

$$F(t+1)=[\text{Sum } (Dt + Dt-1)]/n \quad F(t+1)=Ft + \alpha (Dt-Ft)$$

$$Q^* = \sqrt{\frac{2DC_o}{IC}} \quad Q_p^* = \sqrt{\frac{2DC_s}{C_h \left(1 - \frac{d}{p}\right)}}$$