ISyE 3104
Homework 3 Answers

1. a) Firing cost -- $2400
Six weeks severance (40 hrs/week at $9.50/hr) = $2280
Additional paperwork and decline in morale = $120

b) Hiring cost -- $1300
Training = $1200
Advertising position = $50
Other costs = $50

c) Total relevant material and overhead costs for t-shirts -- $3.20 per shirt (under the current raw material supplier)
Material cost = $2.00
Variable overhead = $1.20 (Note: fixed overhead is NOT relevant to this decision)

d) Total relevant material and overhead costs for golf shirts -- $5.50 per shirt (under the current raw material supplier)
Material cost = $3.50
Variable overhead = $2.00 (Same note about fixed overhead here!)

2. Irrelevant additional quantitative information
-- Factory lease information
-- Pricing policy
-- Equipment loan information
-- Labor shift information (even split and overlapping of shifts)
-- Fixed overhead cost

3. Like in every aspect of life, balance is also very crucial for a manager’s way of handling his/her personal relationships. The friendly relationship between an employee and a manager improves the work place in terms of productivity and fun, however when there is a conflict with professional interests, business should supersede. The reason why the manager is hired is that to make the company a better one, so a manager should be careful in balancing his/her primal goal, which is business, and the other auxiliary components of work life.

4. Being a long-term/loyal employee is a rewarding quality in any business. Considering that the most valuable asset of any company is its people, and then the more the devotion of an employee, the more he/she deserves to be honored. Although there is no certain rules of obligations of a company to its long-term employees, in practice companies give more benefits, more vacation time and more respect. It is true that some privileges are more deserved by some people than the others, however it is again the business/financial rules that dictate which actions to take and how to treat their employees differently in terms of their years of service. On the other hand, the appreciation of service always
helps companies maintain a much loyal workforce for long years and it also boost the morale of relatively new employees.

5. a. Turnkey approach to outsourcing means consolidation of outsourcing activities to a single provider instead of many, which increases the level of communication and control in the supply chain while bringing higher risks.

b. Planning-physical If a contract manufacturer (CM) is given the authority to decide how much capacity and materials is needed, it can pick how much and from who to its own advantage.

Planning – informational When the CM provides the forecasts directly to suppliers, the buyer can inflate the forecasts.

Planning – Financial Lack of involvement by the OEM in the supplier selection and negotiation of contracts may lead under-performing, non-quality products, because the CM might have other priorities or concerns while contracting.

Execution- physical When CM tracks inventory and receives goods, it can use goods or materials as unintended by the OEM. CM can exploit this possession of goods.

Execution- Informational The CM can place the orders according to its self interest, even though the OEM guidelines say the opposite.

Execution –Financial The CM can try to get financial benefit from transactions by slowing the cash flow to suppliers, while increasing it from OEM.

Management – physical If CM controls the inventory rebalancing, it can get save some time to meet OEM demand by expediting the shipments from suppliers, which costs to OEM.

Management – Information CM can manipulate the data or at least selectively report to sugarcoat the reality, especially if the performance measures of CM is based on the data that CM is analyzing.

Management – Financial If CM monitors costs and develops suppliers, it can retain financial benefits, create charges and under-invest in support.

c. It is risky because a successful outsourcing requires high investments of technology, people and time; and when you don’t give these, you loose control over the procurement, which can deviate in favor of the company you outsourced for controlling your procurement.

6. In Equal Exchange model, the entire middlemen is eliminated from the supply chain, which actually eat up the deserved share of the farmers that are mostly in South America. Now in this model, the majority of the profits are shared between the company and the
farmers. Building long-term trade partnerships with the farmers, they can keep the product quality high by keeping the farmers always informed about the contemporary techniques and ways of doing business. In this supply chain, all partners are also financially supported by Equal Exchange, which supports healthy operations. In terms of fair trade, it maintains high margins for producers and keeps the store prices relatively low. It also promotes its products by fair trade concepts to attract more attention from the customers. With its worker-owned structure it also promotes democratic and fair management. All things considered, Equal Exchange is a fair trade company collaborating with its partners in every stage of its supply chain to make sure that the total gains are shared fairly.

**Bonus Question.**

**LP Model using Xpress:**

model "Aggregate Production Planning"
uses "mmxprs", "mmive"

parameters
C_h = 2000
C_f = 2500
C_i = 75
C_r = 40
C_o = 20
C_s = 80
K = 120
end-parameters

declarations
TIME = 0..5            ! Time periods
W, P, I, H, F, O, S: array(TIME) of mpvar
n, DEM : array(TIME) of real
end-declarations

! productivity data
n:=   [1,    0.95,     0.91,     0.85,     0.89,     0.93]
DEM:= [0,    1578,    3524 ,  6856,    5311,     2956]

! Objective function
Cost:= sum(t in TIME) ( C_h*H(t) + C_f*F(t) + C_i*I(t) + C_r*P(t) + C_o*O(t) + C_s*S(t) )
! Initial Workforce level
W(0) = 10

! Initial Inventory Level
I(0) = 0

! Workforce conservation
forall(t in TIME| t > 0) do
  W(t) = W(t-1) + H(t) - F(t)
end-do

! Production Level
forall(t in TIME| t > 0) P(t) = K*n(t)*W(t) + O(t)

! Satisfy demands
forall(t in TIME| t > 0) I(t) = I(t-1) + P(t) + S(t) - DEM(t)

! Overtime limit
forall(t in TIME| t > 0) O(t) <= 500

! Solve as an LP problem
minimize(Cost)
end-model

The solution for part (a) is:

W(0)=10  W(1)=13.8421  W(2)=32.2711  W(3)=49.7285  W(4)=49.7285  W(5)=26.4875
I(0)=0  I(1)=0  I(2)=0  I(3)=0  I(4)=0  I(5)=0
P(0)=0  P(1)=1578  P(2)=3524  P(3)=5572.3  P(4)=5311  P(5)=2956
O(0)=0  O(1)=0  O(2)=0  O(3)=500  O(4)=0  O(5)=0
S(0)=0  S(1)=0  S(2)=0  S(3)=1283.7  S(4)=0  S(5)=0

b. Total Cost : 1.00791e+006
Average inventory = 0

c. put the following constraints to the above model :

W(1) = 14
W(2) = 33
W(3) = 50
W(4) = 50
W(5) = 27
And the new output is:
W(0)=10  W(1)=14  W(2)=33  W(3)=50  W(4)=50  W(5)=27
I(0)=0  I(1)=18  I(2)=97.6  I(3)=0  I(4)=29  I(5)=86.2
P(0)=0  P(1)=1596  P(2)=3603.6  P(3)=5600  P(4)=5340  P(5)=3013.2
O(0)=0  O(1)=0  O(2)=0  O(3)=500  O(4)=0  O(5)=0
S(0)=0  S(1)=0  S(2)=0  S(3)=1158.4  S(4)=0  S(5)=0
Total Cost : 1.02359e+006

The total cost increased, because we didn’t use some capacity of the machines we leased, which turned out to be positive inventory at the end of the month, which increased the total cost.

d. Avg. on-hand inventory = \((18+97.6+0+29+86.2) / 5 = 46.16\)