ASSIGNMENT # 2
Material Requirements Planning (MRP) and Inventory Management

A group of minimum of two (2) and maximum of three (3) students must submit their assignment. Students must work in groups. No individual assignment is allowed unless approved by the professor.

Students are reminded that submitted assignments must be neat, readable, and well-organized. Assignment marks will be adjusted for sloppiness, poor grammar and spelling, as well as for technical errors. Plagiarism on assignments will not be accepted, *each student must sign the statement of integrity.*

E-mail questions related to the assignment should be sent to the Teaching Assistant or posted on the Blackboard Learn course website "Discussion Area" (viewed by all).

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Problem #1

The following table lists the components needed to assemble a final product FP, lead times (in weeks) and quantities on hand.

Item	Lead Time	Amount on Hand	Direct Components
FP	1	10	L(3), C(1), K(2)
L	3	20	B(1), J(3)
C	2	15	G(2), B(2)
K	3	40	H(4), B(3)
B	2	25	
J	2	30	
G	1	5	
H	1	-	

a) If 60 units of the final product FP are to be assembled, how many additional units of B are needed? (You don't need to develop and MRP plan)

b) An order of 60 units of the final product FP is scheduled to be shipped at the start of week 10. What is the latest week that the order can be started and still be ready to ship on time? (You don't need to develop and MRP plan)

Problem # 2

The demand for assembly S is 150 units at the start of week 6.

Each unit of S requires 2 units of T and 3 units of U. Each unit of T requires 2 units of V, 1 unit of W, and 4 units of X. Finally, each unit of U requires 3 units of Y and 1 unit of X.

One firm manufactures all items. It takes 1 week to make S, 2 weeks to make T, 2 weeks to make U, 2 weeks to make V, 3 weeks to make W, 1 week to make X, and 2 weeks to make Y.

a) Construct a product structure tree at a lowest level coding (e.g. Identify all levels, parents, and components).

b) Prepare a time-phased product structure.

c) Construct a Materiel Requirements Plan (MRP) using the following on-hand inventory

Item	On-hand inventory
S	30
T	40
U	20
V	30
W	250
X	50
Y	80

d) In addition to the 150 units of S at the start of week 6, there is also a demand of 50 units of U, which is a component of S. The 50 units of U are needed for maintenance purposes. These 50 units are needed at the start of week 4. Modify the MRP to reflect this change.

e) Is the MRP in part d) feasible? If it is not feasible provide a recommendation on how to make it feasible.

Problem # 3

A company that manufactures paving material for driveways and parking losts expects the following demand for its product for the next four weeks.

Week Number :	1	2	3	4
Material (Tonnes) :	40	50	85	60

The company's labour and machine time standards and available capacities are:

	Labour	**Machine**
Production standard (Hours per tonne)	3	4
Weekly production capacity (Hours)	200	300

a) Determine the capacity requirement for labour and machine for each of the four weeks.
b) In which week(s) do you foresee a problem? What options would you suggest to resolve any problems? What costs are relevant in making a decision on choosing an option?

Problem # 4

A chemical firm produces sodium bisulfate in 100-kg bags. Demand for this product is 15 tonnes per day. The capacity for producing the product is 35 tonnes per day. Setup costs $250, and holding cost is $75 per tonne a year. The firm operates 250 days a year. (Note: 1 tonne = 1,000 kg)

a) How many bags per run are optimal?
b) What would the average inventory be for this lost size? (provide answer in "bags")
c) Determine the approximate length of a production run, in days.
d) About how many runs per year would there be?
e) How much could the company save annually if the setup cost could be reduced to $100 per run?

Problem # 5

Rocky Mountain Tire Center sells 15,000 go-cart tires per year. The ordering cost for each order is $50, and the holding cost is 15% of the purchase price of the tires per year. The purchase price is $18 per tire if fewer than 500 tires are ordered, $17 per tire if 500 or more-but fewer than 1,500-tires are ordered, and $16 per tire if 1,500 or more tires are ordered.

How many tires should Rocky Mountain order each time it places an order? What is the total cost of this policy? Justify your answer and show calculations.

Problem # 6

Demand for walnut fudge ice cream at a grocery store can be approximated by a normal distribution with a mean of 35 kg per week and a standard deviation of 4 kg per week. The new department manager desires a service level policy that has a 98% probability of not stocking out. Lead time from the producer is two days. The store is open seven days a week.

a) If a fixed quantity model is used, what ROP would be consistent with the desired service level?

b) If a fixed-period model is used instead of a fixed quantity model, what order size would be needed for the 98% service level with an order interval of 5 days and a supply of 14 kg on hand at the order time?

c) Suppose that the department manager is using the fixed quantity model described in part a. One day after placing an order with the supplier, the manager receives a call from the supplier that the order will be delayed because of problems with the supplier's plant. The supplier promises to have the order in there in TREE days. After hanging up, the manager checks the supply of the walnut fudge ice cream and finds that 3 kg have been sold since the order was placed. Assuming the supplier's promise is valid, what is the probability that the store will run out of this flavour before the shipments arrives?

Source:
Problem1, 2, 3, 5 and 6: Stevenson, W.J. and Hojati, C. 2011. *Operations Management* (4th Canadian edition). McGraw-Hill/Ryerson. Mass. 741p.