IPFM Prague and University of Hamburg

Institute of Information Systems

Prof. Dr. Stefan Voß

Exam "Production Planning and Logistics"

11 April 2006

Name: _____

First Name (Middle Initial): _____

Student Identification Number: _____

Hints:

- Overall there are 4 assignments.
- The duration of the exam is 60 minutes (if mutual agreement with the head of the program allows 90 minutes, then this should be defined before starting the exam!).
- Please check carefully at the beginning that you have all parts of your examination without any task missing (4 assignments on 8 pages)!
- Please mark any sheet in a clear fashion with your name and identification number!
- The exam is "open book" – but no help from any other "person" is allowed.
- Please write clearly and readable!

Take care about the time used for the specific assignments. Here is an indication for the evaluation and the relative importance of each assignment:

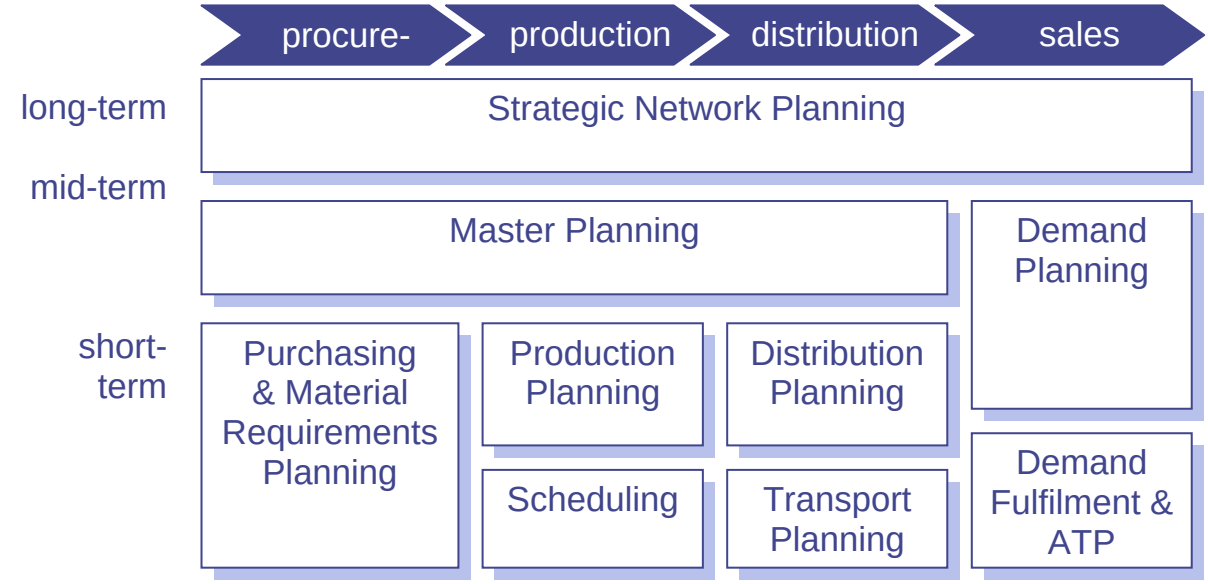
Assignment	***1***	***2***	***3***	***4***	***Sum***
Maximum number of points	*25*	*25*	*24*	*16*	*90*
points					

Mark : _____

1. Supply Chain Integration

Based on your knowledge of Supply Chain Management (including production and logistics), discuss the importance of “Integration” in the context of the “Evolution of Logistics” and Supply Chain Management. Provide some examples where the importance of integration becomes evident (for instance, the importance of information technology, vendor managed inventory). Be concise in your arguments but do not forget to provide enough detail.

2. Supply Chain Planning Reference Model

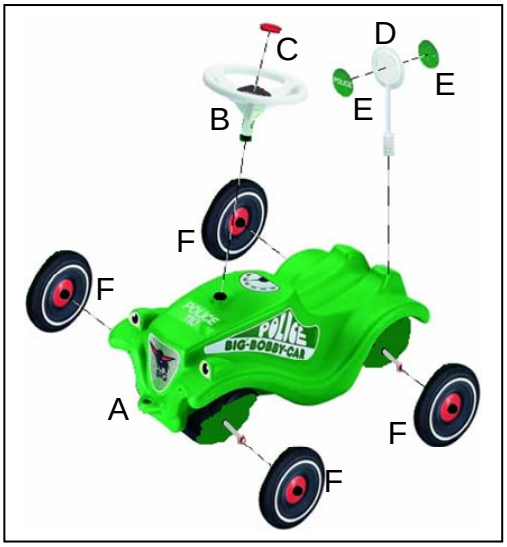


a) Consider the given Reference Model and explain its most important aspects.

b) Explain some “Supply Chain Contract” – term in detail and put it into perspective to the above reference model. Where would contracts be “located” within the model?

3. Supply Chain Planning

Consider yourself a global player in the toy car industry. The explosion sketch on the right shows the parts needed to assemble the toy police car. Parts are produced in different factories building up a supply chain. Your goal is to plan the material requirements along the supply chain based upon the product structure and the data given below.

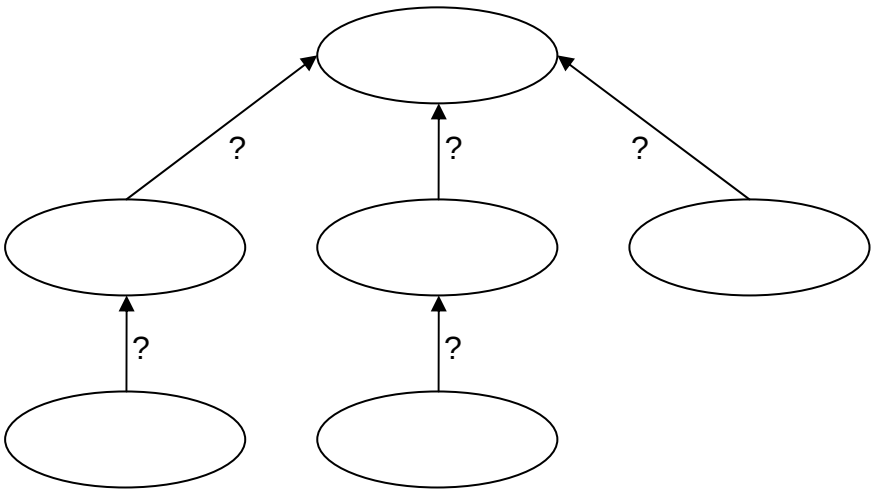


The following demand has been forecasted in the next seven time periods: 600, 700, 1000, 500, 700, 400, 1000.

In the following the bill of materials with all needed data is given:

SKU	Lead Time	Minimum Order Quantity	Components	Initial Inventory
A. Toy Police Car Body	1	400	1×B, 1×D, 4×F	1200
B. Steering Wheel	3	600	1×C	2000
C. Squeeky Horn	2	180	-	1200
D. Signalling Disc	5	800	2×E	3000
E. Police Sticker	4	1000	-	1600
F. Wheel	3	2000	-	8000

a) Sketch the product structure by a graph, in which the nodes represent the SKUs and the arc weights depict the number of components needed.



b) Calculate the material requirements plans for each SKU. You want to order as late as possible but not too late! (Hints: Lead times are assumed to be measured in periods. Planned receipts need not be integer multiples of minimum order quantities.)

Toy Police Car Body	Period						
	1	2	3	4	5	6	7
Demand							
Inventory Plan ()							
Planned Receipts							
Planned Releases							

Steering Wheel	Period						
	1	2	3	4	5	6	7
Demand							
Inventory Plan ()							
Planned Receipts							
Planned Releases							

Squeeky Horn	Period						
	1	2	3	4	5	6	7
Demand							
Inventory Plan ()							
Planned Receipts							
Planned Releases							

Signalling Disc	Period						
	1	2	3	4	5	6	7
Demand							
Inventory Plan ()							
Planned Receipts							
Planned Releases							

Police Stickers	Period						
	1	2	3	4	5	6	7
Demand							
Inventory Plan ()							
Planned Receipts							
Planned Releases							

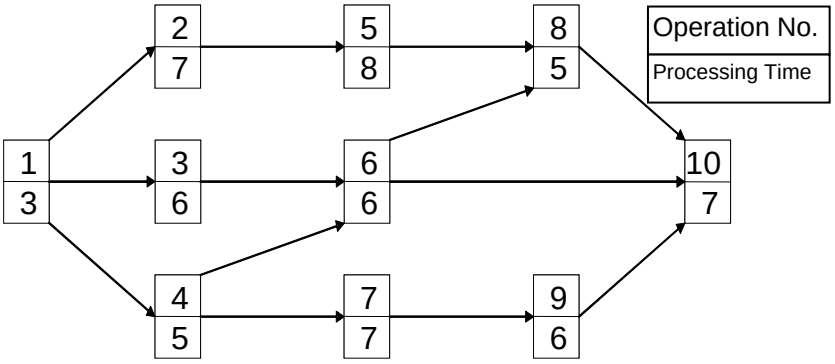
Wheels	Period						
	1	2	3	4	5	6	7
Demand							
Inventory Plan ()							
Planned Receipts							
Planned Releases							

c) The Toy Police Car Body (A), the Steering Wheel (B) as well as the Signalling Disc (D) have to be assembled. Therefore, three resources (R1, R2, R3) have to be considered. R1 is able to produce 1000 units of A per period. R2 is able to produce 1000 units of B per period. R3 has per-period capacity of 150 time units and one unit of D being produced by R3 consumes 0,5 time units. What model do you suggest to solve this extended problem setting. (Give some argument concerning your decision.)

d) Based on the solution you have found in b), decide whether this solution is feasible for the constraints given in c). (Give some argument concerning your decision.)

4. Assembly Line Balancing

Assume that you need to help a car manufacturer to build up his/her assembly line. Even if you have never seen such a problem before, you might consider trying to think about possible solutions and helpful comments by just carefully looking at the task and trying to "invent" meaningful ideas. The figure on the right represents data for a simple assembly line balancing problem (operations with corresponding processing times and precedence relations).



a) Use a simple priority rule to solve the following problem: Minimize the number of stations subject to a given cycle time of 15 (i.e., at most 15 units of processing time are allowed to be worked on in each station). As priority rule choose the largest processing time (choose among all tasks that are available without violating precedence constraints that one which has the largest processing time). As tie break-rule (i.e., for making a choice in case that different options with the same largest processing time arise) use the smallest number (operation) of the corresponding task. Provide all necessary steps for your calculations.

b) 600 minutes of total processing time are available per day. And each day at least 40 units of the product (car) have to be produced. What is the minimum and maximum cycle time in order to achieve the minimum output of 40 units per day?

c) What is the minimum and maximum number of stations in the assembly line according to the cycle time bounds calculated in b)?

d) What is the output based on the minimum possible cycle time, if not more than one station is set up for an operation?