

EXAM PRODUCTION PLANNING & QUALITY CONTROL

Please take note of the following:

- This exam consists of 3 questions with sub-questions for a total of 100 points. Some questions have additional sub-questions indicated with (i), (ii), etc. Make sure to address them all explicitly and note on your paper which sub-question you are addressing. Please mark all of your material clearly with name and student number.
- You are required to answer all questions *in English*.
- You are allowed to consult prints of the articles and slides during the test. Highlighting and notes on the articles and slides are allowed. Printed or written summaries or prints of other material are not allowed.
- Only simple, non-programmable calculators are allowed.
- Telephones and other technical devices must be switched off and stored away.
- Give precise answers to the questions. Your answer must show that you have studied the articles and the slides. Avoid superficial, generic answers. Where possible, refer to the article(s) (including section) you base your reasoning on.

Good luck!!

Question 1: Generic topics (44 points)

- According to Wheelwright (1984), mixing multiple dominant foci is risky. (i) Explain why this is the case (4 points) (ii) Wheelwright wrote his article in 1984, before the concept of Smart Industries existed. Does the warning of Wheelwright still hold in this light? Explain why or why not (3 points).
- (i) Why do high volume/low variance and low volume/high variance usually go hand in hand (4p)? (ii) Which Smart Industry concept challenges this principle (3p)?
- Explain why, in the previous century, cognitive and social factors of work were often neglected in theories on production system design (7p).
- Explain the differences between a product layout and a process layout (max 70 words) (7p).
- The sales manager of a manufacturer of horse trailers wants to know how long customers have to wait before their orders are shipped. He knows that the yearly sales is approximately 1150 trailers. He visits the factory floor at 5 days to look at the order book and writes down how many customer orders are either not yet started or being worked on: 34, 87, 50, 14, and 54. Determine the expected lead time for customers and show your calculation (4p).
- Describe how defunctionalization contributes to Lean Manufacturing (7p).
- A company that usually has stable demand uses Kanban operated pull production. One of their customers starts an advertisement campaign and expects a temporary increase in demand. How can the company handle this within their pull production system (5p).

Question 2: Cellular Manufacturing (31 points)

- List four possible benefits of cellular manufacturing compared to a product layout. Explain each of the benefits (7p).

b. Provide at least three possible disadvantages, reasons, or situations that would prevent you from opting for cellular manufacturing (6p).

Case description for sub questions c and d: The company AllMetal in the village Kolham currently makes the following products: steel and aluminum bicycle frames for a high-end bicycle manufacturer, steel pipes for central heating, steel traffic signs, and frames for steel seats. The production process is currently organized as process layout. The pipes for the bicycle frames are first sawn in the sawing department, after which the pipes are bent in the bending shop and welded at the welding line. There are, in fact, two welding lines: welding steel, and welding aluminum. This is because most steel welders are not qualified for aluminum welding. The aluminum welders can, however, all weld steel. The heating pipes follow the same process, but they do not need to be welded. For the traffic signs, plates are cut in the right shape in the cutting department, after which the edge is bent in the bending shop. For the seat frames, steel pipes are first sawn (sawmill) and bent (bending). Holes are then drilled into the tubes and the tubes are screwed together. These last two operations are done in the assembly department. For an upscale American model seat frame ("The Big Dog"), an additional steel reinforcement beam is welded under each seat. The company policy is aimed at maintaining flexibility towards the market. To this end, the company profiles itself as a metal processing company without specifically focusing on one product. In recent years, however, heating pipes and aluminum bicycle frames in particular have become important products with a lot of continuity in demand.

The owner of the company was informed at a conference that good results have been achieved at other companies with the introduction of cellular manufacturing. He approaches you for advice.

c. Determine a cell structure using the Rank Order Cluster Algorithm described by King (1980). Show all steps that you make (10p).

d. What would your advice to the company be? Include your arguments (8p).

Question 3: Line Balancing (25 points)

a. Explain for 5 of the differences between SALBP and the real world (Falkenauer, 2005, section 3) how they are caused by behavioral factors. Where possible, use terms/concepts as discussed in the slides and articles on Behavioral Operations Management (7p).

A company wishes to switch from a process layout to a balanced paced production line. Given are the following tasks, task times in minutes, and precedence relations:

Task	Time	Precedence
A	4	
B	14	A
C	28	B
D	6	A
E	12	
F	14	D
G	12	B, F

b. Demand is 15 products per working day of 8 hours. Propose a balance line based on either the Rank Positional Weight procedure or the Longest Processing Time procedure. Show all steps that you make (10p).

c. Due to the variation in task times, problems occur regularly at the bottleneck station. The manufacturer now wants to choose from the following alternatives: change to an unpaced production line, allow a small stock before the bottleneck station, increase the cycle time, or increase the capacity of the bottleneck station. Which of these alternatives do you think is the best? Why (8p)?

-- end of the exam --