

# EXAM PRODUCTION PLANNING & QUALITY CONTROL

17-06-2015 14.00-17.00

## Please take note of the following:

- This exam consists of three main questions. Many questions have several 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
- You are required to answer all questions *in English*
- ***You are required to answer each question on a separate sheet.***
- Please mark all of your material clearly with name and student number.
- Books and dictionaries are not allowed.
- **No toilet visits** are allowed during the exam (faculty policy).

### Attention:

1. Answer in English
2. Start your answer to each of the three questions on a separate sheet.

## QUESTION 1: LEAN PRINCIPLES AND RELATED TOPICS (30%)

- (a) List the seven types of waste initially recognized by Toyota.
- (b) Shortly describe what the following three perspectives on Lean Production mean using an example for each: (i) management philosophy, (ii) collection of methods, (iii) system for production planning and control. Which of these perspectives did Toyota originally start with?
- (c) During the lectures it was proposed that variability is the root of all evil. Describe how the choice between (1) Time Based Maintenance and (2) Condition Based Maintenance can influence variability of respectively (1) the production processes, and (2) the organization of the maintenance process itself.

A factory with two departments produces metal parts for Tables, Chairs, and Benches. One department drills the holes, the other department saws the parts. The parts for the tables need to be sawed first which takes 2 hours per batch. After that, drilling takes two hours as well for a batch. The parts for the chairs take the same amount of time, but for these parts, the sequence is the other way around, so first drilling, then sawing. Lastly, the parts for the benches need to be sawed first (which takes 3 hours per batch). After that, drilling takes 1 hour per batch. All jobs can start at period 1, and the due date for all batches is period 8.

- (d) (i) Create a schedule for the above described problem using a Gantt Chart (a matrix with time on the x-axis, departments on the y-axis, and operations in the cells). Use the *shortest processing time* priority rule. (ii) Determine the capacity utilization for the two departments.

- (e) Indicate where in the Gantt Chart which of the 7 wastes occur.

- (f) Describe how a Kanban production system changes the role of scheduling in an organization.

## QUESTION 2: QUALITY CONTROL IN PRODUCTS AND SERVICES (35%)

Please start your answer on a new sheet!

- (a) Last year, approximately 10% of the students overlooked the request to start on a new sheet (a new empty sheet; not a new page on the sheet you used for Question 1). This leads to extra handling, delays in throughput, and a higher risk for mistakes. If you started this question on a new, empty sheet, please write down "Yes" on your answer sheet for question 2a. If not, please take a new sheet.

- (b) What is pokayoke and why is it used?

(c) Give in total three examples of pokayoke: (i) one example of pokayoke in production of goods, (ii) one example in production of services that concerns the service provider, and (iii) one example in production of services that concerns the customer.

(d) Do you agree or disagree with the following statement?

*Human sensory inspections in production of goods are done by employees whereas in services, an organization should decide to involve customers in inspections.*

Please explain your answer.

(e) Explain two ways in which quality assurance can be paid attention to on an industry level.

(f) Name and describe 4 elements of the service package.

(g) Explain what is the most important issue in designing services of high quality and explain why this is most important.

### QUESTION 3: LINE BALANCING (35%)

Please start your answer on a new sheet!

(a) If you started this question on a new, empty sheet (so not a new page of the sheet you used for Question 1 or 2, but a new empty sheet), please write down "Yes" on your answer sheet for question 3a. If not, please take a new sheet.

(b) Describe for each of the performance criteria Quality, Speed, Dependability, Flexibility, and Cost whether a product layout would be better, or a process layout, or that there would be no difference. Please explain.

A producer makes very expensive diamond rings on an unpaced production line. Demand is 300 products per month. Production takes place on weekdays between 08.30 and 17.00 with an half-hour lunch break. Assembling a ring consists of 7 activities ('a' to 'g'), with the following task times (in minutes) and precedence relations:

Task	Time	Preceding task
a	4	
b	24	a
c	27	a
d	4	b
e	14	
f	14	d
g	12	b

(c) Draw a precedence diagram of the product.

(d) What should be the Cycle Time?

(e) Propose a balanced line. You can choose a technique that is either explained at the lectures or in the book. Make sure that you mention which technique was used and provide the steps you take.

(f) Calculate the efficiency of the line.

(g) The insurance company that insures the expensive rings prefers that the diamonds are in the safe instead of on the shop floor. Therefore they calculate the insurance based on the number of minutes that the diamonds are on the shop floor. Calculate the minimum throughput time of the rings going through your proposed production line (assuming that the diamonds are needed in each activity).