

## **Exam preparation Production Planning & Quality Control (2015)**

- Closed book, no books allowed, also no English or other dictionaries allowed
- Open questions (no or limited multiple choice)
- Questions:
  - i. Knowledge
  - ii. Interpretation of lecture material, analysis
  - iii. One or more calculations. Formulas will be provided.
- Exam material:
  - Nicholas chapters as discussed during lectures (see lecture schedule for chapters)
  - All documents on the PPQC Nestor site under Slides
  - The lecture slides indicate the most important topics
- Important: please be precise, complete and concise in your answers. When a description is asked, or the difference between two aspects (e.g. What is the difference between Push and Pull Production?) be accurate/precise in your descriptions.
- Make sure that you pay sufficient attention to your argumentation / explanation. If you make assumptions, for example in calculations, please mention them explicitly.
- When calculations are required, the formulas will be provided.
- The exam will be in English. You are also required to answer in English.
- Regular FEB exam rules will apply (e.g. no toilet visits).

# EXAMPLE EXAM PRODUCTION PLANNING & QUALITY CONTROL

## Please take note of the following:

- This exam consists of three main questions.
- Many questions have several subquestions indicated with (i), (ii), etc. Make sure to address them all explicitly and note on your paper which subquestion 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.
- No books; no dictionaries
- 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 (40%)

- (a) Please list the seven types of waste initially recognized by Toyota.
- (b) The seven types of waste as recognized by Toyota have been mainly developed from manufacturing settings in which goods are produced. Waste however, can also be identified in services such as health care, cruise holidays, or financial services. Please provide four types of waste that you could come across in service settings, and provide an example for each of the four types of waste you identify.
- (c) Nicholas describes “America’s Fall from Manufacturing Grace” that started in the 1950’s, at which time Japan emerged as a industrial power. What are, according to you, the two most important reasons that America fell behind? Please explain your answer.
- (d) According to Toyota, holding inventory is very disadvantageous for a company. (i) Provide three reasons why this would be true. (ii) Provide two example of situations inventory is necessary. Please explain.
- (e) What is Condition Based Maintenance? Please explain and provide a (fictitious or real) example of a CBM application in your explanation. (ii) Please provide three requirements CBM.
- (f) Explain (i) why, in a lean production system, variability is the root of all evil. (ii) Provide 3 examples of variability, (iii) 3 ways to handle variability, and (iv) 3 reasons to explicitly choose for variability.

## QUESTION 2: QUALITY CONTROL (30%)

Please start your answer on a new sheet!

- (a) Quality is a multifaceted concept and can be looked upon from different perspectives. Name three perspectives on quality and explain how these three perspectives differ from each other.

- (b) The design of a product is important for the quality it ultimately delivers to the end customer. This importance of design holds for both physical goods and intangible services. During the lecture on quality management five aspects were presented that should be taken into account when designing the service delivery system. Name three of these aspects and describe, by using the example of a cruise holiday, how they should be employed to design for a good quality service.
- (c) Statistical process control is mentioned in the book as one means to control quality. By assessing whether a process is capable of meeting production requirements and showing the variability of a process in a control chart, it becomes visible to managers and/or workers quality of the production process and its outputs can be controlled. Name two drawbacks of statistical process control and explain for each drawback a way in which this drawback can be overcome.
- (d) Nicholas mentions that “the joint application of lean production principles with TQM and Six Sigma methodology has become so common that a term has been coined for it: lean Six Sigma” (p. 105). Please explain how the combination of these three approaches can be synergistic (i.e., the sum is more than the parts).

### **QUESTION 3: CELLULAR MANUFACTURING (30%)**

*Please start your answer on a new sheet!*

MPS Metal Production and Services B.V. (‘MPS’) in Delfzijl, The Netherlands, is a supplier of metal components and currently produces and supplies the following:

- steel and aluminum components for buses (steel: article number BUS001, aluminum: article number BUA001);
- two specialized component (patented by MPS) made of steel for wind turbines (article numbers WT1 and WT2);
- components for fork-lift truck cabins, mainly steel plates (currently only article number FLP) and steel frames (article number FLF).

The production process currently has a functional layout. For the components for busses (BUS001 and BUA001), the routing is as follows: first the metal is sawn (process: sawing), then the components are milled in the automated CNC workstation (process: milling) and then only the steel components (BUS001) receive an additional treatment (process: steel protection). Finally, both types of components are assembled and packaged (process: assembly & packaging). The plates for fork-lift truck cabins (FLP) are first cut out (process: cutting) and then the edges are bent (process: bending). They do not need manual assembly or packaging, because of a very efficient supply system with the customer. The steel frames (FLF) undergo the following processes: sawing, milling, bending, welding, steel protection, and packaging. The specialized components WT1 and WT2 undergo the following processes: sawing, cutting, bending and assembly & packaging. Even though these two components are made of steel, they do not require steel protection (the customer is of the opinion that that process is not necessary and therefore calls it ‘waste’).

Company policy is such that MPS wishes to maintain flexible towards the market, and MPS wishes to support a wide range of customers with many different requirements. MPS claims that this provides a secure stream of business for the future. However, in coming years, particularly the specialized

components WT1 and WT2 are expected to increase in sales considerably due to the new wind parks that will be installed near the coast of China.

Management of MPS is considering to adopt a group production layout.

- (a) Describe for each of the performance criteria Quality, Speed, Dependability, Flexibility, and Cost whether (in general, so not necessarily related to the case description above) a product layout would be better, or a process layout, or that there would be no difference. Please explain.
- (b) Describe the most important underlying principles of Group Technology.
- (c) Apply Binary Ordering to the described production situation to propose a group production layout. Clearly indicate and explain the steps that you take. If you need to make assumption(s), please do so and indicate the assumption(s).
- (d) (i) Propose, based on subquestion (c), a group layout. (ii) Explain the advantages and disadvantages of your group layout compared to the current structure, using the performance criteria Quality, Speed, Dependability, Flexibility, and Cost. (iii) Describe the effect of the new layout on scheduling. (iv) Would you advice to use a group production layout in this case, or would you go for another layout? Please provide sufficient argumentation to your answer.