**EXAM**

# Production, Maintenance and Quality development (PPU404)

Date: 2016-08-16                                   Time: 14.10-19.30

Exam: TEN 1                                        Utilities: Calculator, dictionary

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Max score: 35 p
Pass (Swedish, 3 – ECTS, E): 18p
ECTS, D: 21
Swedish, 4: 25
ECTS, C: 25
ECTS, B: 28
Swedish, 5: 30
ECTS, A: 32

# Good Luck!

## Q 1:

Chen, et.al (2008) present a case study, in which one of their improvements was to implement a "Rabbit chasing system".

    a. What are the main principles for a Rabbit chasing system?

    b. Which were the main purposes of the introduction of this Rabbit chasing system?

(5 P.)

## Q 2:

What's the average capacity (components per hour) of the production line below?

| CT = 98s. A = 92% | CT = 92s. A = 89% | CT = 102s. A = 90% | CT = 54s. A = 87% |
| --- | --- | --- | --- |
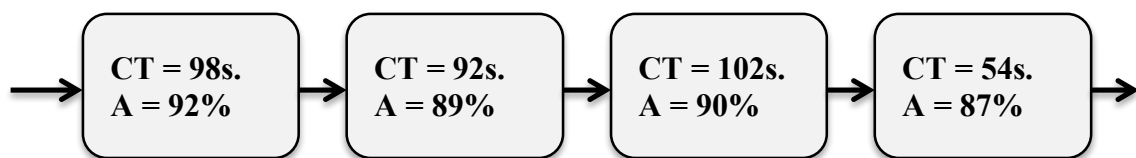
CT = Cycle time, A = Availability

(5 P.)

## Q 3:

According to Stålberg and Fundin, seven challenges could be observed in the process of reaching a holistic perspective on production system improvement. Which are they?

(5 P.)

## Q 4:

According to Bruch, why should you apply a process perspective on system development?

(3 P.)

## Q 5:

Name three "triggers of inefficiency", associated with "improvements in vain"?

(3 P.)

## Q 6:

The system that is shown below keep the fluid level in tank T2 at a certain level. I order to function the system need to fulfill the following conditions:

1. The level sensor S1 has to be functional
2. Either P1 has to be working and V1 open, and V2 closed **or:**
3. P2 has to be working and V2 open and V1 closed.
4. Also, there has to be fluid in tank T1

Draw a Fault tree for the top event: "Low level in T2".
**Base the Fault tree only on the above mentioned circumstances.**

(5 P.)
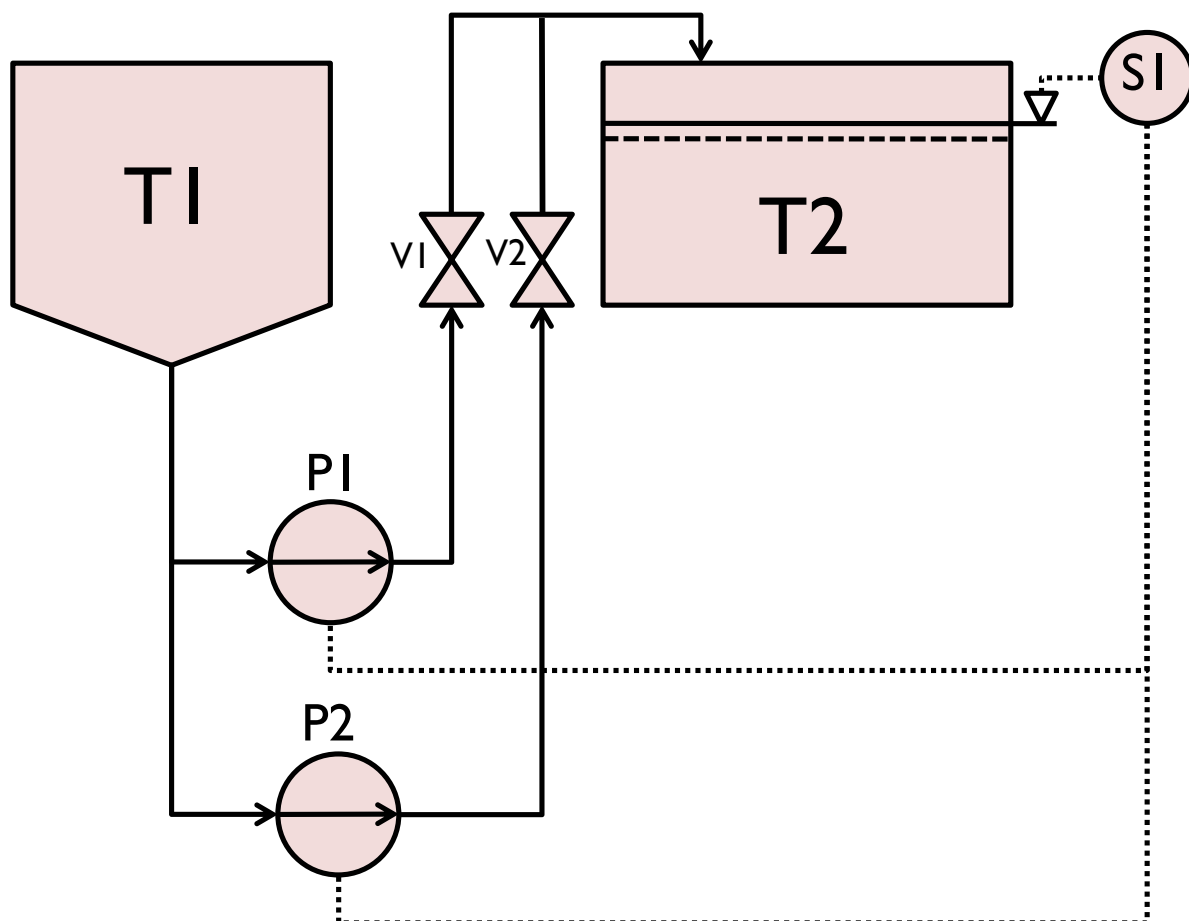
## Q 7:

Acme engineering is about to start producing a new product with an estimated life cycle of 25 years. In order to produce it, the company needs to buy a new machine and two alternatives have been selected. Both alternatives are expected to run 4300 h/y. The data of the two alternatives is found below:

| Data | Machine X | Machine Y |
| --- | --- | --- |
| Acquisition cost | 1350000 € | 930000 € |
| Maintenance cost | 11500 €/y | 14000 €/y |
| Life length | 30 y | 35 y |
| MTBF | 350 h | 300 h |
| MTTR | 2 h | 3 h |
| Cost of downtime | 480 €/h | 480 €/h |
| Operations cost | 42000 €/y | 48000 €/y |

Calculate the LCC for both machines and recommend which one is the better choice from an LCC perspective.

(3 P.)

$$LCC = C_A + t_C(C_O + C_M + C_{DT})$$

$C_A$ : Acquisition cost
$t_C$ : time of comparison
$C_O$ : Operations cost
$C_M$ : Maintenance cost
$C_{DT}$ : Downtime cost

## Q 8:

Name three of the characteristics of world class manufacturers, according to Wisner and Fawcett (1991).

(3 P.)

## Q 9:

MacDuffie means that it is important to evaluate problems and their solutions in terms of quality criteria before evaluating them in terms of cost. Why is that?

(3 P.)