Mittuniversitetet
MID SWEDEN UNIVERSITY

Försättsblad Prov Original

Kurskod	Provkod	Tentamensdatum
ET086G	T101	2019-04-23
Kursnamn	Elektroteknik GR (B), Styr- och reglerteknik	
Provnamn	Skriftlig tentamen	
Ort	Sundsvall	
Termin		
Ämne		

Date: 2019-04-23 (3 hours)
Allowed aids: Calculator, Ordinary dictionary
Responsible Teacher: Mazhar Hussain, tel: 0101428748

(E-mail: mazhar.hussain@miun.se)

Number of tasks: 06

Number of pages: 10

Maximum points: 100 (50 points required to pass)

Instructions for submitted solutions:

- Rationale and justifications may not be so scarce that they become difficult to follow.
- The reasoning behind used equations should be explained.
- The calculations shall be sufficiently complete to show how the final result was obtained.
- Each task must be concluded with a clearly written answer.
- Answer all questions.
- Do not write any answer on question paper.
- Answers can be written in English or in Swedish.

1. Choose the suitable answer.
Note: There will be no negative points for wrong answer.

1.1. Large proportional band makes the controller_______ (1p)

a. **More sensitive**
b. **Low cost**
c. **Multivariable**
d. **Less sensitive**

1.2. The controller compares the CURRENT Value (PV) and SET Value (SP) and calculate______ (1p)

a. **Gain**
b. **Error**
c. **Control signal**
d. **Proportional band**

1.3. To minimize the Oscillations in the process the controller need to be__ (1p)

a. **Switched off**
b. **Connected through Profinet**
c. **Optimized**
d. **Slow**

1.4. Why the controller should be optimized? (1p)

a. **Because improperly optimized controller introduce low quality in the process.**
b. **Because it is good for PLC controller**
c. **Because of high Flow rate.**
d. **Because to observe the complete process chain.**

1.5. A control application where the load varies, which type of control structure can be suitable for such scenario? (1p)

a. **Ratio Control**
b. **Feed-Forward Control**
c. **Cascaded Control**
d. **Both the Ratio and Cascaded Control**

1.6. If the control Error E is more positive when the control signal increases, the action of the controller is said to be: (1p)

a. **Reverse Acting**
b. **Direct Acting**
c. **D Action**
d. **Dynamic error**

1.7. You have a bike that worked well in the past but recently got one error after another, and the errors are frequent. You subconsciously start thinking to switch to a newer bike. What function makes you think like that?(1p)

a. **Integrator function**
b. **Proportional function**
c. **Proportional band**
d. **Derivative function**

1.8. Figure01 is a symbol of___ (1p)
Note: In APPENDIX1, table T-2 and table T- 3 contain some symbolic names.

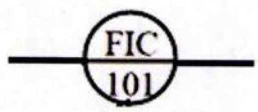

Figure01

a. **Flow indicating and conductivity**
b. **Flow Indicating and controlling**
c. **Controlling and indicating unit for Fire**
d. **Operating object that indicate and control**

1.9. A car's cruise control mechanism is to maintain the Set-Point speed. Cruise control is very effective to reduce the effect of: (1p)

- **a. Integral time that could add a delay in car's response.**
- **b. Disturbances, which influence the process and alter the process variable (i.e. speed).**
- **c. Derivative time, which creates a negative manipulating signal.**
- **d. Proportional gain which induces a steady state error**

1.10. In a controller with *PID* or *PD mode,* if the Control Variable (*CV*) increases because of disturbance in the process (*for example a heating process*) then the *D component* forms a____________. (1p)

- **a. Positive manipulating variable to support the increase in Control Variable.**
- **b. Stationary error to avoid oscillation**
- **c. High gain to increase the control variable as much as possible**
- **d. Negative manipulating variable to counteract the increase in Control Variable**

1.11. Imagine that an unexpected cold breeze sweeping through a residential area that is heated by district heating system. Sudden load increases sharply and the boiler has to produce more heat. Even if boiler is rapidly increasing its power, still it will take a long time to have hot water from the heating plant to the consumer. This time is called: (1p)

- **a. Time Constant**
- **b. Integrating time**
- **c. Dead Time**
- **d. P-time**
- **e. Derivation time**

1.12. One goal of having a control system in a process is to keep the error value as close to zero as possible. But almost all systems have some kind of allowable fluctuation in error, meaning that the error can vary from zero by a certain amount without holding back the final product. The term use for this fluctuation allowance is commonly known as: (1p)

- **a. Proportional band**
- **b. Error Dead band**
- **c. Direct acting controller**
- **d. Transfer function**

1.13. An equation that describes a process in terms of response over time, as well as calculates the outcome of the process variable(PV) is called: (1p)

- **a. Laplace transform**
- **b. Process dynamics**
- **c. Transfer function**
- **d. Step response**

1.14. In a process if the change in control variable from 55% to 75% creates a change in temperature (PV) from 65 °C to 81 °C what will be the process gain? (1p)

a. **0.8 °C/%**
b. **1 °C**
c. **0.8 °C**
d. **1 °C / %**

1.15. In a process if there is a step change in input and the process variable gives an oscillating response before reaching to steady state as shown in this figure02. What type of response is this? (1p)

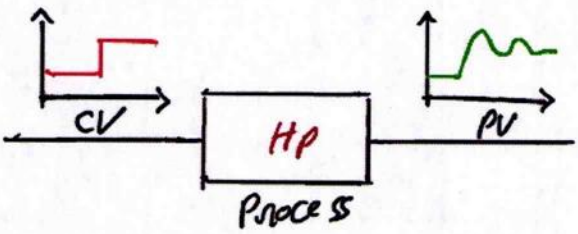

Figure02

a. **First order lag or First order response**
b. **Second order lag or Second order response**
c. **Step response.**
d. **Cascaded control**

1.16. Which of these option represent controller's open loop transfer function: (1p)

a. $Hc = \frac{CV}{E}$

b. $Hc = \frac{PV}{CV}$

c. $Hc = Hp$

d. $Hc = \frac{E}{PV}$

1.17. If a process is using a discrete mode controller then the response is usually: (1p)

a. **Conditionally stable**
b. **Stable**
c. **Unstable**
d. **Transient**