**SY50 FINAL EXAM 2nd PART**

25 June 2013 from 10h15 to 12h15 in classroom P239 in Sevenans5

**No documents allowed. Mobile phones are to be turned off. No translators allowed**

**No I-phone, I-pad, No Tablet, No Portable PC allowed**

**Calculators allowed.**

**EACH CORRECT ANSWER IS 1 POINT**

**PART ON NEURAL NETWORKS**

Y

2

1

3

4

5

W32

X2

X1

W53

W54

W42

W31

W52

W41

W51

Figure 1: MLP neural network

**Q1**

Consider fig. 1 with a pattern learning. Which of the following is correct? (TS=Training Set)

1. *The MLP weights are updated, for each pattern presentation of the TS, before the errors are back-propagated*
2. *The MLP weights are updated with an error back propagation, before a forward processing of TS data is made*
3. *The MLP weights are updated after that a forward processing of TS data is made for each pattern presentation*
4. *The MLP weights are updated after that a forward processing of TS data is made for each epoch presentation*

**Q2**

Consider fig. 1. Which of the following is correct?

1. 
2. 
3. 
4. 

**Q3**

Consider fig. 1 with all initial values of the weights equal to 0. Which of the following is correct?

1. *The weight update starts in a slower way than with random initial values, so the learning phase is slow*
2. *The learning phase requires much more iterations since the initial weight vector point is remote from the closest local minimum*
3. *The learning phase evolves quickly.*
4. *The learning phase never starts.*

**Q4**

Consider fig. 1 with a pattern learning and consider the weights of the direct connections between the 1st layer and the last layer. Which of the following is correct?

1. *They affect only the activation function of neuron 5*
2. *They affect directly the back-propagation of the error in computing the delta’s of the hidden neurons*
3. *They .affect the back-propagation of the error from neuron 5 to input units*
4. *.Their update depends only on the output of neuron 6 and δ6.*

**Q5**

Consider fig. 1. Which of the following is correct?

1. 
2. 
3. *+*
4. 

**PART ON STATE VARIABLE FEEDBACK (SVF)**

A unity-feedback system has the forward transfer function:



The desired specifications are *1<Mp< 1.16, ts < 2 s, tp < 1.6 s, Kx> 2.5 s-*1and no steady-state error to a unit step input.

Since these specifications cannot be met by the uncompensated system, try to synthesize a desired control ratio that satisfies them. Then use the SVF to find the values of the feedback. Please consider that a cascade compensator must be added. Remember that the system is an all-pole system

(*hint: to simplify computation select a=1, while for possible non dominant poles always select values equal -25 and use the same notation used in TD’s for the feedback weights, i.e. k1 is the feedback coefficient for the output and so on*)

Then answer the following questions

**Q6**

1. *The feedback weights are* 
2. *The feedback weights are* 
3. *The feedback weights are* 
4. *The feedback weights are* 

**Q7**

1. *The desired control ratio dominant poles are -2±j3*
2. *The desired control ratio dominant poles are -0.5±j3*
3. *The desired control ratio dominant poles are -2±j3.3*
4. *The desired control ratio dominant poles are -2±j3.87*

**Q8**

The fact that the loop sensitivity is high results in

1. *The open-loop poles are close to the open-loop zeros*
2. *The closed-loop poles are close to the open-loop poles*
3. *The closed loop zeros are close to the open-loop zeros*
4. *The closed loop poles are close to open-loop zeros*

**Q9**

1. *The desired control ratio has one non-dominant pole*
2. *The desired control ratio has two non-dominant poles*
3. *The desired control ratio has three non- dominant pole*
4. *The desired control ratio has no non dominant poles*

*.*

**Q10**

The fact that the loop sensitivity is high results in

1. *Low sensitivity to variation of the input*
2. *High sensitivity to variations of the parameters*
3. *Low sensitivity to increasing values of the loop sensitivity*
4. *Low sensitivity to decreasing values of loop sensitivity*