# Exam Neural Networks (Theory Part)
# August 17, 2004

**Please do not use any notes, books, slides, etc.**

1. **Perceptron/Adaline**
   - (15 points) Describe the Perceptron architecture, neuron model and learning algorithm.
   - (10 points) Under what assumption(s) does the perceptron learning algorithm terminate its execution successfully (that is, no example of the training set is misclassified)?
2. **Feed-Forward Neural Networks (FFNNs)**
   - (10 points) Give an example of supervised and unsupervised learning tasks.
   - (15 points) Consider in a 2-dimensional input space four points from two classes. The two points $(0.5, 0.5)$, $(-0.5, -0.5)$ with class label $-1$ and the other two points $(0.5, -0.5)$, $(-0.5, 0.5)$ with class label $+1$. Describe the architecture and weights of a FFNN that discriminates these two classes.
3. **Radial Basis Function Networks/Support Vector Machines**
   - (10 points) Describe the differences between RBF networks and FFNN.
   - (10 points) Describe the hidden neuron model of a RBF network.
4. **Self Organizing Maps/Competitive learning**
   - (5 points) Is the SOM algorithm used for supervised or unsupervised learning?
   - (10 points) Describe the K-means algorithm.
5. **Hopfield Networks**
   - (15 points) Describe in detail the following components of Hopfield discrete NN: number of neurons, architecture, weights computation, NN execution (retrieval).