Exam Neural Networks (Theory Part)
February 16, 2006

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

1. **Perceptron/Adaline**
   - (10 points) Describe the Perceptron architecture and learning algorithm.
   - (15 points) Prove that if the training set is linearly separable then the perceptron training algorithm terminates.
2. **Learning/Feed-Forward Neural Networks (FFNNs)**
   - (15 points) Describe architecture and weights of a neural network for the XOR problem.
   - (10 points) What are the differences between FFNN and the Adaline?
3. **Radial Basis Function (RBF) Networks**
   - (5 points) What is a radial basis function?
   - (5 points) Is it possible to sove the XOR with a RBF neural network?
4. **Self Organizing Map (SOM)/Competitive learning/k-means**
   - (5 points) Give an example of unsupervised learning task.
   - (10 points) Describe the k-means algorithm.
5. **Hopfield Networks**
   - (5 points) Give an example of a real-life task that can be tackled with a Hopfield network.
   - (10 points) Describe the discrete Hopfield network: architecture, network state, computation of weights and network execution.
6. **Support Vector Machines (SVM)**
   - (10 points) What are the advantages of a linear SVM with respect to the Perceptron?