**ECE 595 Homework 5 Due: March 25, 8 PM**

**1**. Use MATLAB to initialize and train a single neuron perceptron for the following pattern vectors. Note that *tk* refers to the observed output, or class, for the *kth* input vector **P***k*.



Initialize with and use a learning rate of α = 1.

Using the trained network, classify the two given patterns:

Turn in your code, results with the final weight vector and bias, and the classes for **U**1 and **U**2.

**2**. Using a perceptron with bias and an initial value of , determine and plot the class boundary for the given data, *halfmoon.mat* in MATLAB. Note that the class values are implicit – above x2 = 0 line goes with class = 1 and below x2 = 0 with class = 0.

(a) Plot the two-class data (use red dot, for example, for class = 1, and blue dot for class = 0) first to see where a boundary line may exist and then superimpose your calculated hypothesis boundary line. You may run your PLA until all patterns are correctly recognized.

Note that you need to check all data points to complete an epoch. For terminating your PLA, check if the error between the actual and the predicted class is zero for all data points in an epoch.

(b) Test the trained perceptron using the data read from the file, *halfmoonTest.mat*. How many points in the test set are misclassified?

