EEL 6825 A simple quiz Jan. 4, 2005 J.B. Gao

1. Use your intuition and imagination, in 4 – 5 simple sentences, surmise which topics should be covered in our Pattern Recognition course. (Hint: you may think problems ranging from deep down under the ground to high above in the sky, including our very human being.)

2. Consider a random process $X(t) = A\sin(\omega t + \theta), -\infty < t < \infty$, where A is a constant and ω and θ are two independent random variables uniformly distributed with their pdf given by

$$P_\theta(\theta) = \begin{cases} 1/2\pi, & 0 \le \theta \le 2\pi \\ 0, & elsewhere \end{cases} \tag{1}$$

$$P_\omega(\omega) = \begin{cases} 1/\omega_0, & 0 \le \omega \le \omega_0 \\ 0, & elsewhere \end{cases} \tag{2}$$

Find mean and autocorrelation for $X(t)$.

3. Assume that 2-dimensional random vectors x and y, defined by $x = [x_1, x_2]$ and $y = [y_1, y_2]$ are characterized by the following probability density functions:

$$p(x) = \begin{cases} k_x, & 2 \le x_1 \le 3 \;\; and \;\; 0 \le x_2 \le 3 \\ 0, & elsewhere \end{cases} \tag{3}$$

$$p(y) = \begin{cases} k_y e^{\frac{y_1 + 2y_2}{4}}, & 0 \le y_1 \le \ln 2 \;\; and \;\; 0 \le y_2 \le \ln 2 \\ 0, & elsewhere \end{cases} \tag{4}$$

Compute

(a) Constants k_x and k_y.

(b) mean vectors for x and y.