ESTIMATION AND DETECTION THEORY

HOMEWORK # 5:

Please work out the **five** (5) problems stated below – HVP refers to the text: H. Vincent Poor, *An Introduction to Signal Detection and Estimation* (Second Edition), Springer Texts in Electrical Engineering Springer, New York (NY), 2010. With this in mind, Exercise **II.2** (HVP) refers to Exercise 2 for Chapter II of HVP. Exercises are located at the end of each chapter.

Show work and **explain** reasoning.

1.

Solve Exercise **II.13** (HVP).

2.

Solve Exercise **II.14** (HVP).

3.

Solve Exercise **II.19** (HVP).

4.

Solve Exercise **II.20** (HVP).

5.

An $\mathbb{R}$-valued rv Y is said to be uniformly distributed over the finite interval (a,b) (with $a<b$), written $Y \sim \mathrm{U}(a,b)$, if its probability distribution function admits the density $f:\mathbb{R}\to\mathbb{R}_+$ (with respect to Lebesgue measure) given by

$$f(y) = \begin{cases} \frac{1}{b-a} & \text{if } a \le x \le y \\ 0 & \text{otherwise.} \end{cases}$$

Consider the ternary simple hypothesis problem

$$H_m: \ Y \sim \mathrm{U}(a_m, b_m), \quad m = 0,1,2$$

where $a_0 = -1$, $b_0 = -1$, $a_1 = 0$, $b_1 = 2$, $a_2 = -2$ and $b_2 = 0$. Assume uniform prior, i.e., $p_0 = p_1 = p_2 = \frac{1}{3}$.

5.a Find the test that minimizes the probability of error.

5.b What is the minimum probability of error?