ASTU EPCE 6205, Mid\_Term Exam, 2014.02 22 Prof. S.Kim

1. True/False
2. Given probability space
3. then is mutually exclusive : (true, false)

Sol: **False**

is mutually exclusive if

1. There is a set such that for any event , (true, False)

Sol: **True**

, then

And

1. Assume that are independent Gaussians, answer the following
2. is Gaussian. (true, false)

Sol: **False**

Assume .

First .

If is a Gaussian,

Assume . Then by the independence

It should be equivalent to (a) i.e.,

* It is no satisfy it 🡪 it is not a Gaussian.

1. , is a Gaussian (true, false)

Sol: **True** (Home assignment)

1. is a probability density function of a random variable , there is

such that . (true, false)

Sol**: False**. Since is an increasing function whose derivative is non negative.

1. Let us consider
2. is (statistically) orthogonal (true, false)

Sol: **False** . If , then are correlated.--> not orthogonal

1. is (statistically) orthogonal (true, false)

Sol: **true** ( see the Lemma Orthogonal)

1. A random process has its correlation as
2. is continuous in mean square sense.(true, false)

Sol: **True ,**  is continuous w.r.t

1. is it differentiable in mean square sense(true, false)

Sol : **True. Since is a second differentiable i.e.,**

1. Consider a R.V. , which is the sum of two independent R.V.s , whose pdfs are following
2. Find pdf of

Sol:

1. If , guess the best estimator

Sol:

* Since x is a uniform distributed in the interval

1. If , guess the best estimator

Sol:

* Since x is a uniform distributed in the interval

1. Consider

where

1. Find

Sol; For the mean

For the variance

* are independent

Hence

In conclusion

1. If the measurement

are independent

Find

Sol:

For the mean

For the variance

Since

And leads to

1. Find the best estimator

(here is a random variable not a constant)

Sol :

1. prediction

Let

1. Estimation

The Kalman gain

In summary

1. Consider a non-linear equation.

with 3 measurements

To estimate , using Newton-Gauss method answer the following, assume

Sol :

First the Jacobian H of

Iterative formula

1. Find

Sol: the initial guess ,

The first reminder is

The first estimator

]

Substitute these to get

1. Find

The second reminder is

%% Comment :

Real (a,b) = (1,1) . See Tut\_Week\_7\_Nonlinear.mlx

1. Consider a stochastic differential equation disturbed by a Brownian motion,

Find

Sol:

Denote

Then

Laplace transform gives

Inverse of is

-The End -