

In the name of God

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STOCHASTIC PROCESSES

Exercise Set 2

( Due Date: 1400/12/26)

1. PDF transformation: By using the flat random generator, produce random gaussian field. Check your results by computing PDF via simple algorithm.
2. PDF transformation: Suppose that in a black box a harmonic oscillator is oscillating and you made a series of snapshots randomly through time. Determine the PDF of the location of the oscillator in the stationary case.
3. Produce 100 random velocities in 3-D which obey the Maxwell-Boltzmann distribution. Suppose that  $kT = 1$ .
4. Suppose that  $x$  has the Pareto distribution,  $p(x) = \frac{a}{x^{a+1}}$  for  $1 \leq x < \infty$ . Find the probability density function of each of the following random variables:

**A** :  $y = x^2$ .

**B** :  $z = \frac{1}{x}$ .

**C** :  $T = \ln(x)$ .

5. According to definition of characteristic function find the relation between Moments and Cumulants.
6. Cumulants and Moments: For the given data set compute  $\mathcal{K}_n$ , for  $n = 2, 3, 4$ , numerically. Also by computing PDF, determine mentioned quantities and compare your results.
7. Suppose that  $\mathcal{K}_1 \neq 0$ , write  $\mathcal{K}_{\mu_1\mu_2\mu_3\mu_4\mu_5}^5$ .

Good luck, Movahed

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