Midterm

**Monte Carlo Methods and their Applications**

# M & C M, Magister 1, English

Question card 1

1. Random variables. Characteristics. Distribution function. Probability Density Function (PDF).
2. Main idea of solution of the problem by Monte Carlo methods.

Question card 2

1. Expectation and its property’s.
2. Chebyshev inequality.

Question card 3

1. Variance and its property’s.
2. Random Variable Generation (RVG). Uniformly distributed random variable in interval . Algorithms.

Question card 4

1. Modeling some discrete integer random variables. Recurrent formula of modeling.
2. Definite integral computing. Variance estimate. Algorithms.

Question card 5

1. Direct modeling (standard method of modeling).
2. Essential sampling method. Theorem.

Question card 6

1. Modeling isotropic vector in three-dimensional space. Algorithms.
2. Discrete Markov chain. Modeling of discrete Markov chains.

Question card 7

1. Solution of the linear algebraic equations system (LAES). Algorithms.
2. Homogeneous Markov chain. Initial density, density of probabilities of conversion , conversion density  and probability of break .

Question card 8

1. Second-order integral equations. Neumann series and its convergence.
2. Solution of the conjugate LAES.

Question card 9

1. Homogeneous Markov chains which breaking with probability 1. Computing of the probabilities of events: ,  и . Breaking condition of chains after finite number conversion with probability 1.
2. Solution of the conjugate integral equation.

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 March 1, 2017