# <u>MAT 5171</u>

## Final exam (oral part)

## April 2020

#### Format for the oral exam

- At the exam, you will choose two topics at random from the list below. You will have 10 minutes to prepare. The third topic will be of your choice, not necessary from the list. Note: some of the topics where not covered in class, please read the appropriate (short) section from the book.
- For the topics indicated, you should know main steps of the proofs, you do not need to know all the details. When I write "statement of the theorem" below, then you do not need to know anything about its proof.
- Bring your assignments. I will ask you a question about a problem that you did some mistakes.
- Exam will last about 30 minutes.

### Topics for the oral exam

- 1. Chapter 22: Law of Large numbers simple version of the weak law by applying Chebyshev inequality; simple version of the strong law by applying Markov inequality; strong law of large numbers, assuming only that the mean is finite, using the truncation argument. Refer to Lecture Notes, pages 1-2;
- 2. Chapter 25: Convergence in distribution definition, properties (Theorems 25.2, 25.4), statement of the Skorokhod representation theorem;
- 3. Chapter 25: Convergence in distribution definition, mapping theorems (Theorems 25.7, 25.8), statement of the Skorokhod representation theorem;
- 4. Chapter 25: Convergence in distribution definition, convergence of maxima, statement of the Skorokhod representation theorem;
- 5. Chapter 25: Convergence in distribution definition, statement of the Skorokhod representation theorem, some counterexamples (for example, like in Exercise 4, Assignment 2 but you can come up with something else, e.g. that convergence in distribution does not give convergence of expectations);
- 6. Chapter 26: Characteristic functions definition, characteristic function of the sum of independent random variables, moments and derivatives (Theorem 26.1).
- 7. Chapter 27: Central Limit Theorem statement, main steps of the proof (a simple version for independent, identically distributed random variables), Cramer-Wold device not covered in class, see page 407;
- 8. Chapters 32-34: Conditional expectation definition (see Theorem 3 in Lecture Notes), basic properties Theorems 34.2, 34.3, 34.4 make sure you know the proof of the properties mentioned in these theorems.
- 9. A question on martingales (to be added).