

## MAIN TOPICS FOR FINAL

- (1) Basic counting
  - (a) Permutations –  $n!$
  - (b)  $k$ -subsets –  $\binom{n}{k}$
- (2) Conditional probability
  - (a) Discrete conditional probability distributions
  - (b) Independent events
  - (c) Conditional pfs and pdfs
  - (d) Bayes' Theorem
- (3) Random variables – discrete and continuous cases
  - (a) pfs and pdfs vs cdfs
  - (b) joint distributions
  - (c) (increasing/decreasing) functions of random variables
- (4) Distributions
  - (a) discrete uniform
  - (b) Bernoulli  $\rightarrow$  binomial
  - (c) continuous uniform
  - (d) exponential
  - (e) standard normal
- (5) Sums of random variables
  - (a) Convolution definition and calculations in discrete and continuous cases.
- (6) Expectation
  - (a) Definition in continuous and discrete cases.
  - (b) Linearity of expectation.
  - (c) Product formula for independent random variables.
- (7) Variation
  - (a) Definition in terms of expectation, how to compute directly.
  - (b) Nonlinearity formulas.
  - (c) Sum formula for independent random variables.
- (8) Weak Law of Large Numbers: idea and statement.
- (9) Central Limit Theorems for iid random variables: idea and statement.

Expect several True/False questions, followed by 3 other questions (possibly with multiple parts).

The exam is cumulative, but weighted towards the end of the semester.

Use of notes, books, or calculators will not be permitted during the exam.