Markov chains. Exam Program

1. Discrete Markov chains: definition, initial distribution, transition matrix
2. Chapman Kolmogorov equations. Transition matrix after m steps
3. Topology of different states: absorbing states, closed classes etc.
4. Absorption probability and mean hitting time. Right Hand Equations.
5. Stopping times. Strong Markov property.
6. Recurrence and Transience as state and class properties
7. Invariant distributions.
8. Left Hand Equations.
9. Stationary distributions.
10. Equilibrium distribution as a limit of the power transition matrix rows.
11. Existence and uniqueness of invariant distributions.
12. Page Rank algorithm. Main idea.
13. Aperiodicity. Ergodic chains.
14. Convergence to equilibrium for ergodic chains.
15. Law of large numbers.
16. Perron Frobenius Theorem.
17. Metropolis algorithm. General idea.

Also, please check the main examples we worked with:
1. Random walks in dimensions 1 and 2
2. Gambler's ruin
3. Birth and death process

At the exam I can ask you to formulate some definitions and theorems from the Part 1. I can also ask you to provide some example or counterexample to the theoretical statement, to decide, either the statement is true or false etc. So the examples we worked with can be useful not only for the problem solving but also for the theoretical part of the exam.