Format and topics for exam 3
Math 142

General information. Exam 2 will be a timed test of 75 minutes, covering sections 6.1–6.3, 7.1, and 7.3–7.4 of the text, or more importantly, PS07–09. No books, notes, calculators, etc., are allowed. Most of the exam will rely on understanding the problem sets (including problems to be done but not to be turned in) and the definitions and theorems that lie behind them. If you can do all of the homework, and you know and understand all of the definitions and the statements of all of the theorems we've studied, you should be in good shape.

You should not spend time memorizing proofs of theorems from the book, but you should definitely spend time memorizing the *statements* of the important theorems in the text. Exam 3 will feature the usual types of questions, though it is likely that all of the problems will be computations or problem-solving with explanation.

Definitions. The most important definitions and symbols we have covered are:

6.1	generating function	power series
	coefficient of x^r	
6.3	partition	
7.1	recurrence relations	initial conditions
	Fibonacci relation	Fibonacci numbers
7.3	characteristic equation	
7.4	homogeneous recurrence relation	inhomogeneous recurrence relation

Theorems, results, algorithms. The most important theorems, results, and algorithms we have covered are listed below. You should understand all of these results, and you should be able to cite them as needed.

Sect. 6.2: Multiplication of generating functions (expansion (6)).

Sect. 6.3: Generating function of partition function.

Sect. 7.3: Solution to linear recurrence relation is linear combination of α_i^n (or if α_i repeated, $n\alpha_i^n$, etc.).

Sect. 7.4: Solution to inhomogeneous recurrence relation is particular solution plus solultion to homogeneous part.

Types of computations. You should also know how to do the following general types of problems.

Sect. 6.1: Modelling with generating functions (possibly via integer solutions).

Sect. 6.2: Calculating coefficient of x^r, esp. for the product of two generating functions (expansion (6)).

Sect. 7.1: Basic recurrence relations (e.g., Fibonacci); taking cases based on the last object. Recurrence relations with forbidden subsequences (no 012). Multivariable recurrence relations (on last box, last ball).

Sect. 7.3: Solving linear recurrence relations: General form based on solutions to characteristic equation, specific example from initial conditions.

Sect. 7.4: Solving inhomogeneous recurrence relations: Applying table of forms in particular cases.

You may also find it useful to review the following important examples from the text:

Sect. 6.1: Exs. 1–4: Finding generating functions for combinatorially defined sequences.

Sect. 6.2: Ex. 1: Using product expansion (6) to calculate coefficients. Exs. 2–4: Solving enumeration problems with generating functions.

Sect. 6.3: Exs. 1–3: Generating functions defined by infinite products, etc.

Sect. 7.1: Exs. 2–6: Recurrence relations based on "What's the last thing that happens. Ex. 7: Forbidden subsequence. Exs. 9–10: More complicated examples. Ex. 11: System of recurrence relations.

Sect. 7.3: Exs. 1–4: Solving linear recurrence relations.

Sect. 7.4: Exs. 1–3: Solving inhomogeneous recurrence relations.

Tables you need to be able to apply.

Sect. 6.2: Table of polynomial/power series expansions (Table 6.1).

Sect. 7.4: Particular solutions for selected inhomogeneous recurrence relations (bottom of p. 305).

Not on exam. (6.3) Ferrers diagrams. (7.1) Difference equations. (7.2) Entire section.
Good luck.