

## Review Guide for Chapter 12

**Definitions:** How are the following terms defined?

- alphabet, string over an alphabet, formal language over an alphabet (*p.* 736)
- $\Sigma^n$ ,  $\Sigma^*$  (the Kleene closure of  $\Sigma$ ), and  $\Sigma^+$  (the positive closure of  $\Sigma$ ), where  $\Sigma$  is an alphabet (*p.* 736)
- concatenation of  $x$  and  $y$ , where  $x$  and  $y$  are strings (*p.* 738)
- concatenation of  $L$  and  $L'$ , where  $L$  and  $L'$  are languages (*p.* 738)
- union of  $L$  and  $L'$ , where  $L$  and  $L'$  are languages (*p.* 738)
- Kleene closure of  $L$ , where  $L$  is a language (*p.* 738)
- regular expression over an alphabet (*p.* 738)
- language defined by a regular expression (*p.* 739)
- finite-state automaton (*p.* 748)
- language accepted by a finite-state automaton (*p.* 750)
- eventual-state function for a finite-state automaton (*p.* 751)
- regular language (*p.* 759)
- $*$ -equivalence of states in a finite-state automaton (*p.* 764)
- $k$ -equivalence of states in a finite-state automaton (*p.* 765)
- quotient automaton (*p.* 769)
- equivalent automata (*p.* 771)

### Regular Expressions

- What is the order of precedence for the operations in a regular expression? (*p.* 737)
- How do you find the language defined by a regular expression? (*p.* 740)
- Given a language, how do you find a regular expression that defines the language? (*p.* 741)
- What are some practical uses of regular expressions? (*p.* 742)

### Finite-State Automata

- How do you construct an annotated next-state table for a finite-state automaton given the transition diagram for the automaton? (*p.* 748)
- How do you construct a transition diagram for a finite-state automaton given its next-state table? (*p.* 749)
- How do you find the state to which a finite-state automaton goes if the characters of a string are input to it? (*p.* 750)
- How do you find the language accepted by a finite-state automaton? (*p.* 750)
- Given a simple formal language, how do you construct a finite-state automaton to accept the language? (*p.* 752)
- How can you use software to simulate the action of a finite-state automaton? (*p.* 754)
- What do the two parts of Kleene's theorem say about the relation between the language accepted by a finite-state automaton and the language defined by a regular expression? (*pp.* 756, 758)
- How can the pigeonhole principle be used to show that a language is not regular? (*p.* 759)
- How do you find the  $k$ -equivalence classes for a finite-state automaton? (*p.* 766)
- How do you find the  $*$ -equivalence classes for a finite-state automaton? (*p.* 767)
- How do you construct the quotient automaton for a finite-state automaton? (*p.* 769)
- What is the relation between the language accepted by a finite-state automaton and the language accepted by the corresponding quotient automaton? (*p.* 769)