

## Homework #3

**Due Date:** Thursday October 20, 2005

Your Name: \_\_\_\_\_

Your Email: \_\_\_\_\_

1. What does FSA stand for?

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2. What does DFA stand for?

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3. What does NFA stand for?

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4. What is the input to a Scanner Generator?

\_\_\_\_\_

5. What is the output?

\_\_\_\_\_

6. Each FSA may have zero, one, or several final states. How many start states will a FSA have?

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7-12. Show a DFA that recognizes the language described by the following regular expressions. Use a graphical representation. Be sure to indicate the start and final state(s) appropriately. Indicate the states with circles. Be sure each state and each edge are labeled appropriately. Do not show error states or edges directed to error states. Be sure your answers are NOT non-deterministic FSAs.

(7)  $x y z$

(8)  $x y^* z$

(9)  $x y + z$

(10)  $a | b | c$

(11)  $(a | b | c)^*$

(12)  $x (a | b | c) (d | e) z$

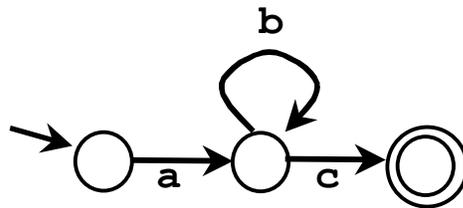
13. Can a DFA have epsilon edges? \_\_\_\_\_

14. Can a NFA have epsilon edges? \_\_\_\_\_

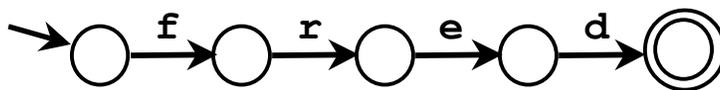
15. Can a DFA have more than one edge coming out of a state with the same label?  
\_\_\_\_\_

16. Can a NFA have more than one edge coming out of a state with the same label?  
\_\_\_\_\_

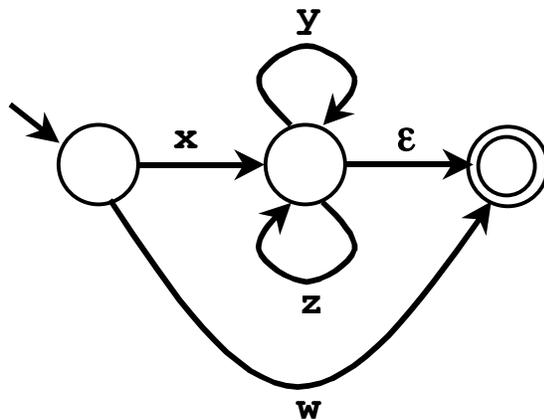
17-21. Here are some FSAs (both DFAs and NFAs). Write a regular expression describing the same language.



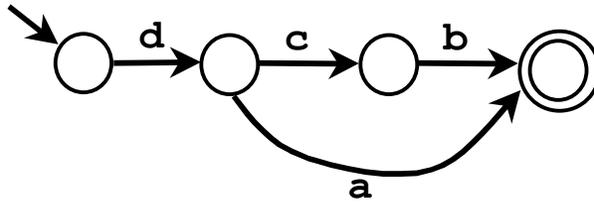
17. \_\_\_\_\_



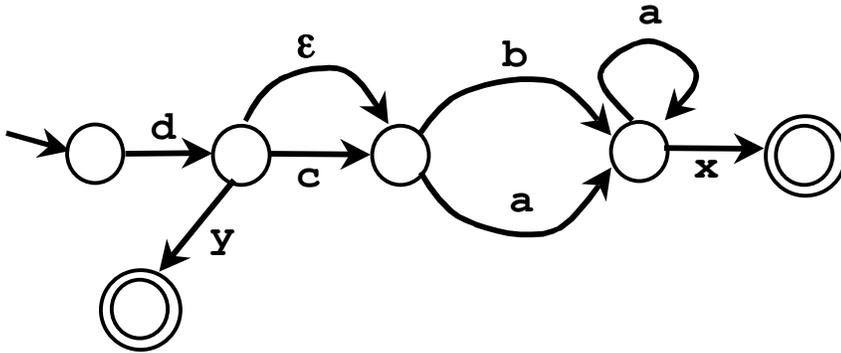
18. \_\_\_\_\_



19. \_\_\_\_\_



20. \_\_\_\_\_



21. \_\_\_\_\_

22. In the formal definition of a DFA,

$$\langle S, \Sigma, \delta, s_0, S_F \rangle$$

we can think of  $\delta$  as a “move” function that takes two arguments and returns a result. What are the two arguments? What is the result?

\_\_\_\_\_

23. In the formal definition of a NFA,

$$\langle S, \Sigma, \delta, s_0, S_F \rangle$$

we can think of  $\delta$  as a “move” function that takes two arguments and returns a result. What are the two arguments? What is the result?

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24. When is a given string “recognized” (we also say “accepted”) by a FSA?

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25. What is the relationship between the set of languages that can be recognized by a DFA and the set of languages that can be recognized by a NFA?

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26. What is the relationship between the set of languages that can be recognized by a DFA and the set of languages that can be described by a regular expression?

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27. What is the relationship between the set of languages that can be recognized by a NFA and the set of languages that can be described by a regular expression?

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28. Is a “regular set” a language? \_\_\_\_\_

29. What is the difference between a “regular set” and a “regular language”?

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30. What is a “regular set”?

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31. What is the input to the algorithm known as “Thompson’s Construction”?

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32. What is the output of Thompson’s Construction?

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33. Describe Thompson’s Construction in outline?

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