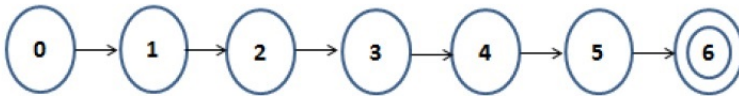**PRINCETON UNIVERSITY**

COS 226–Algorithms and Data Structures

Week 11: *KMP & RE-NFAs*
(Algs. §5.3,5.4)

Version: April 18, 2018

Exercise 1 – Substring search

A. Construct the Knuth-Morris-Pratt DFA for the string PAPAYA over the alphabet {A,P,Y}. Complete the transition diagram and the corresponding DFA table. State 6 is the accept state.

	0	1	2	3	4	5
A						
P						
Y						

B. Suppose that you run the Boyer-Moore algorithm (the basic version considered in the textbook and lecture) to search for the pattern,

D N A A

in the text

X N A A A D N A A

Give the trace of the algorithm in the grid below, circling the characters in the pattern that get compared with characters in the text.

X	N	A	A	A	D	N	A	A
(D)	(N)	(A)	(A)					
	D	(N)	(A)	(A)				
		D	N	A	(A)			
					(D)	(N)	(A)	(A)

Exercise 2 – Regular expressions and Non-Deterministic Finite Automata (REs and NFAs)

A. Consider the NFA given below. The bold lines are the match transitions (the dotted lines are ϵ transitions). Convert and write the corresponding regular expression.
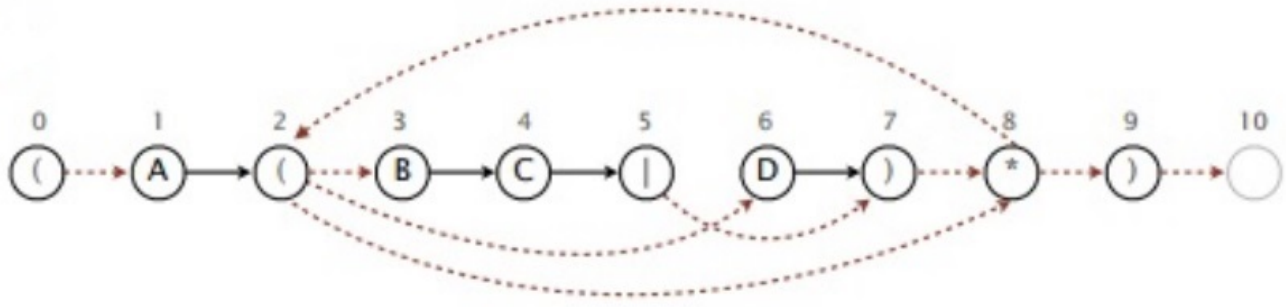
B. Determine which of the strings given in (i) and (ii) below are accepted or rejected by the NFA above. For a string that is accepted show how the machine transitions get to the accept state. When a string is not accepted, show that machine transitions never get to the accept state. To start, you can take epsilon transitions and can be in multiple states before character A is scanned.

(i) ABC

char	states
∅	
A	
B	
C	

String accepted by NFA? Yes / No

(ii) ABCB

char	states
∅	
A	
B	
C	
B	

String accepted by NFA? Yes / No