

Cairo University

Faculty of Computers & Artificial Intelligence

Theory of Computations

Assignment 2 (DFA & NFA)

Instructions

- The assignment is submitted in groups of 4 students from the same lab or the same TA.
- The Deadline for submission is on Tuesday 23/4 at 11:59 pm
- Submission will be on Google Classroom, No late submission, or through e-mail submission is allowed.
- Please submit one compressed folder with the .java files. The folder name should follow this structure: ID1_ID2_ID3_GROUP.zip
- In case of Cheating, you will get a negative grade whether you give the code to someone, take the code from someone/internet, or even send it to someone for any reason.

Requirements

- Solve all the 10 problems.
- For all problems write in Java Language.
- The Java program will take ONE input text file containing the input values for each problem, the program must save the output of each problem in ONE output text file following the required format for each problem.
- Submit all Drawings of automata of all DFAs and NFAs in separated PDF.

Input file:

Starts with the number of the problem, followed by the input values for the problem, then “end” to indicate the input for this problem is finished and to move to the next problem.

Output file:

Starts with the number of the problem, followed by the corresponding output values of the input for the problem, then “x” to indicate the output for this problem is finished and to move to the next problem

DFA

Simulate a Deterministic Finite Automaton:

- The DFA's states
- The alphabet
- The transition function
- The start state
- The set of accepting states

Problem 1

Design a DFA that accepts all strings which do not contain the substring ba over {a, b}

Input
1
ab
ba
aba
bbb
end

Output
1
True
False
False
True
x

Problem 2

Design a DFA that accepts all strings that contains even number of 0's followed by single 1 over {0, 1}

Input
2
1
001
00
0011
end

Output
2
True
True
False
False
x

Problem 3

Design a DFA that accepts all strings that contains odd number of x's over {x, y}.

Input

3
x
xyxyxy
yyy
yxxxy
end

Output

3
True
True
False
True
x

Problem 4

Design a DFA that accepts strings starting and ending with the same characters over {a,b}.

Input

4
aa
bab
baaabab
aaab
end

Output

4
True
True
True
False
x

Problem 5

Design a DFA that accepts all the strings that binary integers divisible by 4 over {0,1}.

Input

5
0
10000
100
101
end

Output

5
True
True
True
False
x

Problem 6

Construct an DFA that accepts all strings $\{W \mid W \text{ is any string except } 11 \text{ and } 111\}$

Input
6
1000
101
0000
111
end

Output
6
True
True
True
False
x

NFA

Simulate a Nondeterministic Finite Automaton (NFA):

- The NFA's states
- The alphabet
- The transition function.
- The start state(s)
- The set of accepting states

Problem 7

Construct an NFA that accepts all strings over the alphabet $\{0, 1\}$ containing an equal number of occurrences of '01' and '10'.

Input
7
010110
1001
0101010101010
101010
end

Output
7
True
True
True
False
x

Problem 8

Design an NFA that accepts all strings over the alphabet $\{0, 1\}$ that contain the substring "101" or "010".

Input 8 101010 001010 010 1001 end
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Output 8 True True True False x

Problem 9

Design an NFA that accepts all strings over the alphabet $\{0, 1\}$ where no two consecutive characters are the same.

Input 9 01 10 010101010101 000 end
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Output 9 True True True False x

Problem 10

Design an NFA that recognizes strings over the alphabet $\{0, 1\}$ where every '0' is followed by at least one '1'.

Input 10 1 010111 010101111 010 End

Output 10 True True True False x
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