Midterm

Due Feb 22 at 3:14pm **Points** 20 **Questions** 20 **Available** Feb 22 at 1pm - Feb 22 at 5pm about 4 hours
Time Limit 100 Minutes

Instructions

Rules

- Total 20 multiple-choice and true/false questions
- Time limit is 100 minutes
- No Internet browsing, no cell phones or other devices
- Closed book, closed notes, and closed neighbors

Open from Feb. 22, 1:00 pm

This quiz was locked Feb 22 at 5pm.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	26 minutes	19 out of 20

ⓘ Correct answers are hidden.

Score for this quiz: **19** out of 20
Submitted Feb 22 at 1:27pm
This attempt took 26 minutes.

Question 1

1 / 1 pts

True or false? In the context of computability, all problems can be solved since one can always adopt a brute-force approach to solve a problem.

- ○ True
- ◉ False

Question 2

1 / 1 pts

True or false? In the context of computational complexity, the problem “sorting a sequence of 1,000,000 numbers” is called “easy” because it is efficiently solvable.

- ◉ True
- ○ False

Question 3

1 / 1 pts

True or false? In the context of computational complexity, the problem “coloring a world map using red, blue, green colors so that no adjacent countries share the same color” is called “hard” because it is currently unknown whether or not it can be solved efficiently.

- (•) True
- ( ) False

Question 4

1 / 1 pts

The *self reduction* technique reduces a problem into itself with a smaller problem size, which naturally leads to a recursive algorithm design, e.g., the binary search algorithm. The correctness of such algorithms intuitively can be proven using the mathematical induction technique.

- (•) True
- ( ) False

Question 5

1 / 1 pts

True or false? Finite Automata do not have any internal memory capabilities.

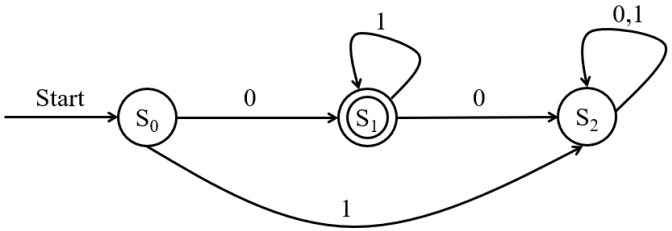
True

False

Question 6

1 / 1 pts

True or false? The following deterministic finite-state automaton recognizes the set of all bit strings such that the first bit is 1 and all remaining bits are 0's.



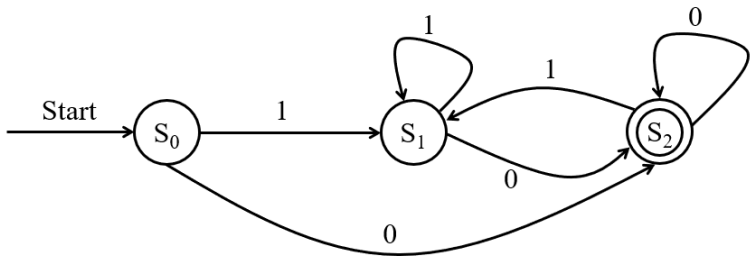
True

False

Question 7

1 / 1 pts

Determine the set of bit strings recognized by the following deterministic finite-state automaton.

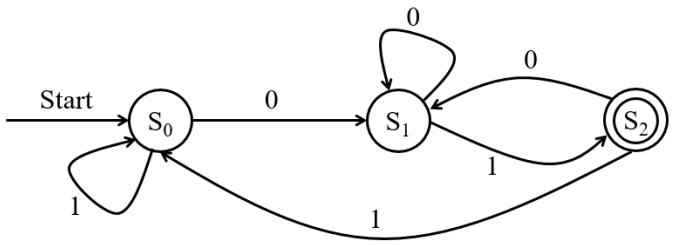


- The set of bit strings start with 1
- The set of bit strings end in 1
- The set of bit strings end in 0
- The set of bit strings start with 0

Question 8

1 / 1 pts

Which of the following statements is incorrect about the given deterministic finite-state machine?



- If the string ends in 0, the string ends in state S1

- (•) The string must start with 0 in order to be recognized by this automaton
- ( ) If the string ends in 11, the string ends in state S0
- ( ) The string must end in 01 in order to be recognized by this automaton

Question 9

1 / 1 pts

True or false? Every regular language can be accepted by a finite automaton.

- (•) True
- ( ) False

Question 10

1 / 1 pts

True or false? The nondeterminism in an NFA cannot be eliminated.

- ( ) True
- (•) False

Question 11

1 / 1 pts

Which of the following statements is incorrect?

- {a,b}*{ab}{a,b}*+{b}*{a}* is not equivalent to {a,b}*
- {a,b}*{ab,bba}{a,b}* represent strings containing ab or bba
- {a,b}*{aa} represent strings ending in aa
- {{a}*{b}*}* is equivalent to {a,b}*

Question 12

1 / 1 pts

Which of the following statements is incorrect?

- Simple languages can be expressed by a formula involving languages containing a single string of length 1 and the operations of union, concatenation and Kleene star are regular languages.
- A grammar is “context free” in the sense that its rules do not say anything about the context in which each piece of syntax may appear.

- (•) Context-free languages must be regular languages.
- ( ) Regular languages must be context-free languages.

Question 13

1 / 1 pts

True or false? Suppose a CFG has productions S -> 01 and S -> 0S1, the language defined by this CFG is L(G) = $\{0^n1^n \mid n \geq 0\}$.

- ( ) True
- (•) False

Question 14

1 / 1 pts

Given the following balanced-parentheses grammar: S -> SS | (S) | (), which of the following is neither a rightmost nor a leftmost derivation.

- (•) S => SS => SSS => S()S => ()()S => ()()()
- ( ) S => SS => S() => (S)() => (())()

S => SS => (S)S => (())S => (())()

None of the others

Question 15

1 / 1 pts

True or false? PDAs are more powerful than NFAs, DFAs, etc. mainly because PDAs have external memory with unlimited size.

True

False

Question 16

1 / 1 pts

Can the set $\{0^n1^n \mid n = 0, 1, 2, \ldots\}$ be recognized by a Finite Automaton?

Yes, it can.

No, it cannot

Question 17

1 / 1 pts

True or false? PDA is equivalent to CFG in terms of language-defining power.

- (•) True
- ( ) False

Question 18

1 / 1 pts

True or false? Deterministic PDA defines all context-free languages.

- ( ) True
- (•) False

Question 19

1 / 1 pts

Which of the following statements is incorrect?

A syntactic analyzer reads a sequence of tokens and decide whether they represent a valid program according to the syntactic grammar of the language being parsed.

A lexical analyzer reads a raw string of characters and turn it into a sequence of tokens.

Syntactic analysis can be done with regular expressions (and therefore by an NFA).

Lexical analysis deals with messy character-level details like variable-naming rules, comments, white spaces, etc., leaving a clean sequence of tokens for the next stage to consume.

Incorrect

Question 20

0 / 1 pts

Which of the following statements is incorrect?

A syntactic analyzer reads a sequence of tokens and decide whether they represent a valid program according to the syntactic grammar of the language being parsed.

The syntactic analyzer can produce additional information about the structure of a valid program in a parse tree, where the internal nodes of the parse tree represent the terminal symbols.

- Lexical analysis can be done with regular expressions (and therefore by an NFA).
- The PDAs can be used to to recognize valid sequences of tokens.

Quiz Score: **19** out of 20