Theory exam test, December 22, 2023

Due No due date **Points** 20 **Questions** 20
Available Dec 22 at 5:15pm - Dec 22 at 6:05pm about 1 hour **Time Limit** 40 Minutes

Instructions

- **You authenticate yourself for the exam by logging into Canvas with your credentials.**
- **You may browse the Internet but cannot use it to communicate with other people or chatbots.**
- **By submitting the quiz, you declare that you worked on your own, and nobody helped you.**
- **By submitting the quiz, you declare that you have not used chatbots (such as Phind, ChatGPT, Bard or Claude) when answering the questions.**
- **Please note that should we notice that you are communicating with your fellows or chatbots, your exam will be terminated immediately.**

The theory test consists of **20 single-choice questions** you must answer in **40 minutes**. You have to solve them in order, one at a time. Please note that you cannot postpone questions or navigate back to previous questions, so select one of the options for each question. The questions as well as the order of the possible answers are randomized. Be careful with time management and don't waste your time on searching for the answer on the Internet.

Grading scale

Percentage	Points	Grade
90-100	18-20	5
75-89	15-17	4
60-74	12-14	3
45-59	9-11	2
0-44	0-8	1

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	37 minutes	14 out of 20

ⓘ Correct answers are hidden.

Score for this quiz: **14** out of 20
Submitted Dec 22 at 5:56pm
This attempt took 37 minutes.

Question 1 1 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → A a
S → b S a
A → S A S
A → b
```

What is the FOLLOW set of A?

- {a, #}
- {a, b}
- {a}
- {b, #}

Question 2

1 / 1 pts

Consider the following regular expression:

```
(a)(a)(a)*
```

Which of the following regular expressions generates the same language?

- a*
- a+a+
- a+
- a*a*

Incorrect

Question 3

0 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → A B
A → b B
```

```
B → c
B → ε
```

Which of the following strings is **not** in the language generated by the grammar?

- bc
- ε
- b
- bcc

Incorrect

Question 4

0 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → x
S → A S
A → a S b
```

What's the relation between the sets FIRST(S) and FOLLOW(A)?

- FIRST(S) = FOLLOW(A)
- FIRST(S) ⊃ FOLLOW(A)
- FIRST(S) ⊂ FOLLOW(A)
- FIRST(S) ∩ FOLLOW(A) = ∅

Question 5

1 / 1 pts

Which of the following is true about epsilon-elimination in nondeterministic finite automatons?

- It eliminates all states except those having epsilon-transitions.
- It eliminates epsilon-transitions.

- It eliminates states that have epsilon-transitions.
- It makes the automaton deterministic.

Question 6

1 / 1 pts

Which of the following is a subset of the regular language defined by the regular expression `ab*|a`?

- (•) `{a, ab}`
- ( ) `{a, aa}`
- ( ) `{ab, ba}`
- ( ) `{aba}`

Question 7

1 / 1 pts

Which of the following regular expressions can generate the string `aaa`?

- ( ) `(aa)*`
- ( ) `ab*`
- ( ) `aba*a*`
- (•) `ab*a*a`

Incorrect

Question 8

0 / 1 pts

Predictive bottom-up parsing of a sentence yields the …

- ( ) rightmost derivation of the sentence.

- (●) handle of the sentence.
- ( ) leftmost derivation of the sentence.
- ( ) viable prefixes of the sentence.

Question 9

1 / 1 pts

Consider the following grammar (the start symbol is `S`):

```
S → A b
S → A c
A → a
```

Which of the following statements is true?

- ( ) The grammar's language is infinite.
- ( ) The grammar is not context-free.
- (●) The grammar is not LL(1).
- ( ) The grammar is not regular.

Question 10

1 / 1 pts

The primary role of programming language compilers is to …

- (●) analyze programs and translate them to other languages.
- ( ) specify/define programming languages.
- ( ) find logic errors and bugs in programs.
- ( ) provide language servers for programming languages.

Question 11

1 / 1 pts

In the name SLR(1), the 1 means that the parser …

- only supports grammars with at most 1 production rule for each nonterminal.
- can predict the validity of the sentence based on its first symbol.
- uses 1 symbol lookahead to decide on the next action.
- can only reduce handles of length 1.

Question 12

1 / 1 pts

What do we use Thompson's construction for?

- Minimize a finite automaton into an equivalent finite automaton.
- Minimize a regular expression into an equivalent regular expression.
- Transforming a regular expression into an equivalent nondeterministic finite automaton.
- Transforming a nondeterministic finite automaton into an equivalent deterministic finite automaton.

Incorrect

Question 13

0 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → A S | a S
A → A b | A c | d | ε
```

What is the FIRST set of S?

- {a, b, c, d, ε}
- {a, b, c, d}

- {A, a}
- {a}

Question 14

1 / 1 pts

Which of the following regular expressions can generate the empty string?

- a*b
- a++
- (ab)*
- ab*

Incorrect

Question 15

0 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → a A
A → b A
A → c A
A → a b
```

What is the handle of the sentential form abcbA?

- ab
- cb
- cA
- bA

Question 16

1 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → x
S → A S
A → a S b
A → c S d
```

Which of the following LR item sequences represents the viable prefix Ac?

- [S → . A S], [S → A . S], [A → c . S d]
- [S → A . S], [A → c . S d]
- [A → c . S d]
- [S → A . S], [A → . c S d]

Question 17

1 / 1 pts

What is the set of actions an LL parser can take?

- shift, reduce, accept, error
- accept, error
- pop, push
- derive, pop, accept, error

Incorrect

Question 18

0 / 1 pts

Consider the following grammar (the start symbol is S):

```
S → x
S → A S
A → a S b
A → c S d
```

Which of the following is a maximal viable prefix?

- AS
- SAS
- abS
- aSbS

Question 19

1 / 1 pts

Consider the following grammar (the start symbol is `S`):

```
S → x
S → A S
A → a S b
```

Suppose that the LR(0) parser is in configuration `(#0, axbx#)`. What is the next step it takes?

- error
- accept
- reduce
- shift

Question 20

1 / 1 pts

Which of the following compiler phases builds the structure tree of the input program?

- Code generation
- Lexical analysis
- Syntax analysis
- Semantic analysis

Quiz Score: **14** out of 20