

University Computer Science

Name: \_\_\_\_\_ Score: \_\_\_\_\_

1. The course DFA on input aba ends in state –
  - ☐ q0
  - ☐ q2
  - ☐ q1
  - ☐ no state
2. In the layered grammar,  $id + id * id$  has – parse tree(s)
  - ☐ none
  - ☐ two
  - ☐ one
  - ☐ three
3. The halting problem proof builds  $D(M)$  that –
  - ☐ prints banana
  - ☐ rejects everything
  - ☐ loops exactly when  $H$  says  $M$  halts on  $M$
  - ☐ always halts
4. The lexer emits –
  - ☐ (type, lexeme, position) triples
  - ☐ assembly
  - ☐ raw characters
  - ☐ parse trees
5. The  $LL(1)$  table is filled from –
  - ☐ FIRST and FOLLOW sets
  - ☐ parse trees
  - ☐ random choice
  - ☐ the lexer
6. The symbol table binds –
  - ☐ nothing
  - ☐ tokens to trees

- ☐ IR to assembly
  - ☐ identifiers to type and scope
7. The pumping lemma shows  $a^n b^n$  is not regular because –
- ☐ DFAs reject all strings
  - ☐ pumping  $y$  breaks the  $a$ - $b$  count
  - ☐ it has too many symbols
  - ☐ it is infinite
8. The leftmost derivation of  $id + id * id$  takes – steps
- ☐ six
  - ☐ five
  - ☐ seven
  - ☐ four
9. Rice's theorem covers –
- ☐ syntax errors
  - ☐ parser speed
  - ☐ every nontrivial semantic property
  - ☐ memory leaks
10. The input `ifx` lexes as –
- ☐ an error
  - ☐ KW(if) then IDENT(x)
  - ☐ KW(if) then NUM
  - ☐ one IDENT ifx

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1. **q1**

q0-a-q1, q1-b-q2, q2-a-q1: ends q1, rejected (q2 accepts, not q1).

2. **one**

Layering enforces precedence: x binds under T, deeper than +.

3. **loops exactly when H says M halts on M**

D flips the answer about itself - running D on D contradicts.

4. **(type, lexeme, position) triples**

Type for the parser, lexeme for messages, position for errors.

5. **FIRST and FOLLOW sets**

FIRST chooses expansions; FOLLOW handles the empty production.

6. **identifiers to type and scope**

Name resolution before type checking: scoping first.

7. **pumping y breaks the a-b count**

y lies in the a-block; pumping changes the count of a without b.

8. **six**

E, E+T, T+T, id+T, id+T\*F, id+id\*F, id+id\*id - six.

9. **every nontrivial semantic property**

Nontrivial properties of WHAT the program computes - undecidable.

10. **one IDENT ifx**

Greedy longest match: the ident regex permits the longer lexeme.