Exam 29 December

Due Dec 29 at 11am **Points** 30 **Questions** 30
Available Dec 29 at 10am - Dec 29 at 11:05am about 1 hour **Time Limit** 50 Minutes

Instructions

Notation: _ denotes the blank symbol in questions on configurations

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	50 minutes	22 out of 30

ⓘ Correct answers are hidden.

Score for this quiz: **22** out of 30
Submitted Dec 29 at 10:50am
This attempt took 50 minutes.

Question 1

1 / 1 pts

$f(n)=9n^4+5n$ $g(n)=2^{n-2}$

Which one of the following statements holds?

1st statement: f(n)=O(g(n)).

2nd statement: g(n)=O(f(n)).

- (●) Only the 1st statement holds.
- ( ) Only the 2nd statement holds.
- ( ) Both statements hold.
- ( ) None of the two statements holds.

Question 2

1 / 1 pts

$f(n)=n^4+2n$ $g(n)=(2/3)^n$

Which one of the following statements holds?

1st statement: $f(n)=\Omega(g(n))$.

2nd statement: $g(n)=\Omega(f(n))$.

- (●) Only the 1st statement holds.
- ( ) Only the 2nd statement holds.
- ( ) Both statements hold.
- ( ) None of the two statements holds.

Question 3

1 / 1 pts

Let $M = (Q, \Sigma, \Gamma, \delta, q_0 , q_a, q_r)$ be a 2-tape Turing machine. Which one is the starting configuration for input word abb?

- (●) $(q_0,\lambda,abb,\lambda,\_)$
- ( ) $(q_0,abb,\_)$
- ( ) $(q_0, \lambda,abb, \lambda, \lambda)$
- ( ) (q_0,abb, λ)

Question 4

1 / 1 pts

Which one of the following two words can be a configuration of one-tape Turing machine $M = (\{q_0,q_1,q_2\}, \{a,b\}, \Gamma, \delta, q_0 , q_a , q_r)$?

q_1aab or $aabq_1$?

- (●) q_1aab only
- ( ) $aabq_1$ only
- ( ) both of the two words
- ( ) none of the two words

Incorrect

Question 5

0 / 1 pts

Let $M = (Q, \Sigma, \Gamma, \delta, q_0 , q_a , q_r)$ be a 2-tape Turing machine and let _ denote the blank symbol.

Which one of the following statements holds?

1st statement: $(q_0,\lambda,\lambda,\lambda,\lambda)$ is the starting configuration for input λ.

2nd statement: $(q_r,\lambda,\_,\lambda,\_)$ is a rejecting configuration.

- ( ) Only the 1st statement holds.
- ( ) Only the 2nd statement holds.
- (●) Both statements hold.
- ( ) None of the two statements holds.

Incorrect

Question 6

0 / 1 pts

Let M = ({q_0,q_a,q_r},{a,c},{a,b,c,_}, δ, q_0 , q_a , q_r), where the transitions are

δ(q_0,a)=(q_a,b,S),

δ(q_0,b)=(q_a,b,S),

δ(q_0,c)=(q_r,_,L),

δ(q_0,_)=(q_a,_,L).

Is it true, that b∈L(M)? Is it true, that c∈L(M)?

- (●) b∈L(M) only
- ( ) c∈L(M) only
- ( ) both b∈L(M) and c∈L(M) holds
- ( ) none of b∈L(M) and c∈L(M) holds

Question 7

1 / 1 pts

Which one of the following statements can be stated as being TRUE?

1st statement: Let M be an n^3 time bounded nondeterministic Turing machine. Then there exist a deterministic O(n^7) time bounded deterministic Turing machine equivalent with M.

2nd statement: Let M be an n^3 time bounded deterministic 2-tape Turing machine. Then there exist a deterministic O(n^7) time bounded 1-tape deterministic Turing machine equivalent with M.

- ( ) Only the 1st statement holds.
- (●) Only the 2nd statement holds.
- ( ) Both statements hold.
- ( ) None of the two statements holds.

Incorrect

Question 8

0 / 1 pts

Which one of the following statements can not be stated as being TRUE?

- For every deterministic Turing machine there exist an equivalent nondeterministic one.
- For every nondeterministic Turing machine there exist an equivalent deterministic one.
- For every deterministic 3-tape Turing machine of polynomial time complexity there exists an equivalent deterministic 2-tape Turing machine of polynomial time complexity.
- For every nondeterministic Turing machine of polynomial time complexity there exists an equivalent deterministic Turing machine of polynomial time complexity.

Incorrect

Question 9

0 / 1 pts

Let L be a language and M be a nondeterministic Turing machine, such that L(M)=L holds.

Which one of the following statements follows from this assumption?

1st statement: $L \in RE$

2nd statement: $L \in R$

- Only the 1st statement follows.

- Only the 2nd statement follows.
- Both statements follow.
- None of the two statements follows.

Incorrect

Question 10

0 / 1 pts

Which one of the following sequences is NOT a code of 3-state (q_0,q_r,q_a) 1-tape deterministic Turing machine according to the coding given on the lecture? [Before assigning a specific macine for non-codes.]

- 0101000100010001101001000100010001101000100010001000
- 0101010001000110100100100010001101000100101000
- 0101010101101001010101101000101010
- 0101010001011110100100100010001101001001010100

Question 11

1 / 1 pts

Which one of the following statements holds?

1st statement: The cardinality of {L | L⊆ {0,1}*}\RE is countably infinite.

2nd statement: The cardinality of RE\R is countably infinite.

- Only the 1st statement.
- Only the 2nd statement.
- Both statements.

- None of the two statements.

Question 12

1 / 1 pts

Which one of the following statements holds?

1st statement: L_h can be reduced to a decidable language.

2nd statement: The complement language of L_h is in RE.

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.
- None of the two statements holds.

Question 13

1 / 1 pts

Which one of the following statements holds?

1st statement: TSP can be reduced to a decidable language.

2nd statement: The complement language of TSP is in RE.

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.
- None of the two statements holds.

Incorrect

Question 14

0 / 1 pts

Which one of the following statements holds (using the concepts of Rice's theorem)?

1st statement: $\{ L \mid L \subseteq \{0,1\}^* \text{ and } L \text{ is finite} \}$ is a non-trivial property of the recursively enumerable languages.

2nd statement: $\emptyset$ is a trivial property of the recursively enumerable languages.

- (●) Only the 1st statement holds.
- ( ) Only the 2nd statement holds.
- ( ) Both statements hold.
- ( ) None of the two statements holds.

Question 15

1 / 1 pts

Which one of the following statements can be stated being TRUE?

1st statement: The language of unsatisfiable formulas of propositional logic is in P.

2nd statement: The language of valid formulas of first order logic is undecidable.

- ( ) Only the 1st statement.
- (●) Only the 2nd statement.
- ( ) Both statements.
- ( ) None of the two statements.

Question 16

1 / 1 pts

Consider a first order logic including a predicate symbol p and a function symbol f, both of arity 2.

Which one of of the following is a string representation of a first order formula? (x and y are variables)

1. $\forall xf(x,y)$

2. $p(x,y) \vee p(f(y,y),x)$

- only the 1st one
- only the 2nd one
- both
- none of them

Question 17

1 / 1 pts

Let $D=\{(u,v),(w,x)\}$ $(u,v,w,x \in \Sigma^+)$ be an instance of the Post Correspondence Problem. (There are 3 dominos, the first one has u at the top and v at the bottom, the second one has w at the top and x at the bottom.)

Which one of the following statements holds?

1. All solutions of D is a sequence of at most 2 dominos.

2. If $|u|>|v|$ and $|w|>|x|$ then D has no solution

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.

- None of the 2 statement holds.

Question 18

1 / 1 pts

Which one of the following statements holds?

1st statement: For every nondeterministic Turing machine M there exists a grammar generating L(M).

2nd statement: For every grammar G there exists a nondeterministic Turing machine recognizing L(G).

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.
- None of the two statements holds.

Question 19

1 / 1 pts

Which one of the following statements holds?

1st statement: For every nondeterministic Turing machine M there exists a context sensitive grammar generating L(M).

2nd statement: For every context sensitive grammar G there exists a nondeterministic Turing machine recognizing L(G).

- Only the 1st statement.

- (•) Only the 2nd statement.
- ( ) Both statements.
- ( ) None of the two statements.

Incorrect

Question 20

0 / 1 pts

Which one of the following languages can be a language not in P?

- ( ) PERFECT MATCHING
- ( ) REACHABILITY
- ( ) GRAPH ISOMORPHISM
- (•) 2SAT

Question 21

1 / 1 pts

Which one of the following languages is not in NP?

- ( ) GRAPH ISOMORPHISM
- ( ) SUBGRAPH ISOMORPHISM
- (•) UNSATPRED
- ( ) SAT

Question 22

1 / 1 pts

Which one of the following two propositional formulas is a Horn formula?

1. $(\neg x \vee y) \wedge (\neg x \vee \neg z) \wedge y$

2. $(\neg x \vee y \vee \neg z) \wedge (\neg x \vee \neg z \vee \neg w)$

(x,y,z,w are atomic variables)

- only the 1st one
- only the 2nd one
- both of them
- none of them

Question 23

1 / 1 pts

Complete the sentence to make it true.

If ..... then P=NP.

- REACHABILITY is in NP
- there is an NP-complete problem in NP
- there are no NP-intermediete problems in NP
- every problem in NP is reducible to an NP-complete problem

Question 24

1 / 1 pts

Let G be a simple undirected graph of 20 vertices.

Which one of the following statements holds?

1st statement: If G is 4-colorable, then G is 5-colorable.

2nd statement: If G has a vertex cover of size 7, then G has a vertex cover of size 8.

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.
- None of the two statements holds.

Question 25

1 / 1 pts

Let L and L' be languages and assume that L is in NP. Then the following proves NP-completeness of L.

- $L \leq L'$ and L' is NP-complete
- $L \leq_p L'$ and L' is NP-complete
- $L' \leq_p L$ and L' is NP-complete
- $L' \leq L$ and L' is NP-complete

Question 26

1 / 1 pts

Which one of the following statements holds?

1st statement: If P=NP is FALSE, then there exists a non-NP-complete language in NP\P.

2nd statement: If P=NP, then PRIME FACTORIZATION is not NP-intermediete.

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.
- None of the two statements holds.

Question 27

1 / 1 pts

Which one of the following statements holds?

1st statement: Space complexity class coNL is the complement of space complexity class NL.

2nd statement: NL⊆ coNL.

- Only the 1st statement holds.
- Only the 2nd statement holds.
- Both statements hold.
- None of the two statements holds.

Question 28

1 / 1 pts

Which one of the following statements can be stated being TRUE?

1st statement: $TIME(n^2) \subseteq NSPACE(n^2)$

2nd statement: SPACE(n^2)⊆NTIME(n^2)

- (●) Only the 1st statement.
- ( ) Only the 2nd statement.
- ( ) Both statements.
- ( ) None of the two statements.

Question 29

1 / 1 pts

Which one of the following statements holds?

1st statement: There is a language which can be decided by nondeterministic offline Turing machine of O(nlog n) space complexity, but can not be decided by a deterministic offline Turing machine of polynomial space complexity.

2nd statement: There is a language in NP which can not be decided by a deterministic offline Turing machine of polynomial space complexity.

- ( ) Only the 1st statement holds.
- ( ) Only the 2nd statement holds.
- ( ) Both statements hold.
- (●) None of the two statements holds.

Incorrect

Question 30

0 / 1 pts

Which one of the following statements can be stated being TRUE?

1st statement: Every PSPACE-complete language is in NPSPACE.

2nd statement: 3SAT is PSPACE-complete.

- Only the 1st statement.
- Only the 2nd statement.
- Both statements.
- None of the statements.

Quiz Score: **22** out of 30