Exam 20 December

Due Dec 20 at 5pm   **Points** 30   **Questions** 30
Available Dec 20 at 4pm - Dec 20 at 5:05pm 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](#)	48 minutes	21 out of 30

ⓘ Correct answers are hidden.

Score for this quiz: **21** out of 30
Submitted Dec 20 at 4:49pm
This attempt took 48 minutes.

Question 1   **1 / 1 pts**

$f(n)=3\log_8 n$, $g(n)=5\log_2 n$.

Claim1: $f(n)=\Omega(g(n))$.

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

Which one of the 2 claims holds?

- ○ Claim 1 only

- ○ Claim 2 only

- ◉ both claims hold

- ○ none of the two claims holds

Incorrect   **Question 2**   **0 / 1 pts**

Let f and g be **N**->$\mathbf{R_0^+}$ functions. Suppose, that the limit of the sequence f/g does not exists (as n -> +infinity).

Which of the following statements follows from this assumption?

1st statement: $f(n)=\Omega(g(n))$ does not hold.

2nd statement: $g(n)=\Omega(f(n))$ does not hold.

○ Only the 1st statement follows.

○ Only the 2nd statement follows.

◉ Both statements follow.

○ None of the two statements follows.

Incorrect

Question 3

0 / 1 pts

Let M = (Q, Σ, Γ, δ, 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}, Γ, δ, q_0 , q_a , q_r) ?

$q_1$aab or aabq$_1$?

   ◉ $q_1$aab only

   ○ aabq_1 only

   ○ both of the two words

   ○ none of the two words

Question 5   1 / 1 pts

Let M be a nondeterministic Turing machine and let |- and |-* denote its one-step and multi-step transition relation, respectively..

Which one of the following statements holds?

1st statement: If K is a configuration of M then K |-* K holds.

2nd statement: If K and K' are configurations of M and K |- K' holds, then K |-* K' holds as well.

   ○ Only the 1st statement holds.

   ○ Only the 2nd statement holds.

   ◉ Both statements hold.

   ○ None of the two statements holds.

Question 6   1 / 1 pts

Suppose, that L can be decided by an $f(n)=2n\log_2 n$ time bounded deterministic Turing machine.

Which one of the following statments follows from this assumption?

1st statement: L is in P.

2nd statement: L is not in P.

○ Only the 1st statement follows.

○ Only the 2nd statement follows.

○ Both statements follow.

○ None of the two statements follows.

Incorrect

Question 7   0 / 1 pts

Suppose, that L can be decided by an $f(n)=3^n+2n^2$ time bounded deterministic Turing machine.

Which one of the following statments follows from this assumption?

1st statement: L is in P.

2nd statement: L is not in P.

○ Only the 1st statement follows.

◉ Only the 2nd statement follows.

○ Both statements follow.

○ None of the two statements follows.

Question 8   1 / 1 pts

Which one of the following statments hold?

1st statement: If $L \in NTIME(f(n))$ then $L \in TIME(2^{O(f(n))})$.

2nd statement: If $L \in TIME(f(n))$ then $L \in NTIME(f(n))$.

○ Only the 1st statement holds.

○ Only the 2nd statement holds.

○ Both statements hold.

○ None of the two statements holds.

Question 9   1 / 1 pts

Suppose, that L can be decided by an $f(n)=2n+3\log_2 n$ time bounded deterministic Turing machine.

Which one of the following statments follows from this assumption?

1st statement: L is in P.

2nd statement: L is in NP.

○ 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 statements can be stated as being TRUE?

1st statement: Let M be a nondeterministic Turing machine of $f(n)=n^3$ time complexity. Then there exist a deterministic Turing machine of $O(n^7)$ time complexity equivalent with M.

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

○ Only the 1st statement holds.

○ Only the 2nd statement holds.

◉ Both statements hold.

○ None of the two statements holds.

Incorrect

Question 11

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 12

0 / 1 pts

Which one of the following two statements holds?

1st statement: No bijection exists between {L| L⊆{0,1}*} and the set of Turing machines of input alphabet {0,1}.

2nd statement: No bijection exists between {0,1}* and the set of real numbers of the [0,1] interval.

◉ 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: Every language is recognizable by a Turing machine.

2nd statement: $RE \subset R$

○ Only the 1st statement holds.

○ Only the 2nd statement holds.

○ Both statements hold.

◉ None of the two statements holds.

Question 14   1 / 1 pts

Which one of the following statements holds?

1st statement: The complement language of L_{diag} is undecidable.

2nd statement: L_{diag} is reducible to a Turing-recognizable language.

◉ 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 satisfiable conjunctive normal forms of propositional logic is in P.

2nd statement: The language of satisfiable formulas of first order logic is not in P.

○ Only the 1st statement.

◉ Only the 2nd statement.

○ Both statements.

○ None of the two statements.

Incorrect

Question 16　　　　　　　　　　　　　　　　　　　　0 / 1 pts

Consider a first order logic including a predicate symbol q 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. $\forall y f(y,y)$

2. $q(x,y) \lor q(f(x,y))$

◉ only the 1st one

○ only the 2nd one

○ both

○ none of them

Question 17　　　　　　　　　　　　　　　　　　　　1 / 1 pts

Let $D=\{(u,v),(w,x),(y,z)\}$ $(u,v,w,x,y,z\in\Sigma^+)$ 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, the third one has y at the top and z at the bottom.)

Which one of the following statements holds?

1. If uwuu=vxvv then D has a solution.

2. All solutions of D is a sequence of at most 3 dominos.

- ◉ 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: According to Rice's Theorem it is undecidable whether a Turing machine recognizes the language {01,11,101}.

2nd statement: According to Rice's Theorem it is undecidable whether a Turing machine recognizes a recursively enumerable language.

- ◉ 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 languages is not in NP?

    ○   REACHABILITY

    ●   VALIDITYPRED

    ○   2SAT

    ○   INDEPENDENT SET

Question 20   1 / 1 pts

Which one of the following formulas is a 3CNF?

1. $((\neg p \vee q \vee \neg r) \wedge (\neg p \vee \neg r \vee \neg s)) \vee (q \wedge r \wedge s)$

2. $(\neg p \vee q) \wedge (\neg r \vee \neg q)$

(p,q,r,s are atomic variables)

    ○   only the 1st one

    ○   only the 2nd one

    ○   both

    ●   none of them

Question 21   1 / 1 pts

Which one of the following statements holds?

1st statement: If 2-COLORING is in P, then P=NP.

2nd statement: If VERTEX COVER is in P, then P=NP.

    ○   Only the 1st statement holds.

    ●   Only the 2nd statement holds.

    ○   Both statements hold.

○ None of the two statements holds.

Question 22

1 / 1 pts

Let G be a simple undirected graph of 20 vertices.

Which one of the following statements holds?

1st statement: If G ha a vertex cover of size 8 then G has an independent set of size 12.

2nd statement: If G has an independent set of size 12, then G has a clique of size 8.

◉ Only the 1st statement holds.

○ Only the 2nd statement holds.

○ Both statements hold.

○ None of the two statements holds.

Question 23

1 / 1 pts

Which one of the following statements holds?

1st statement: If $L_1 \leq_p L_2$ then $L_1 \leq L_2$.

2nd statement: If $L_1 \leq_p L_2$ then the complement of $L_1 \leq_p$ the complement of L_2 .

○ Only the 1st statement holds.

○ Only the 2nd statement holds.

◉ Both statements hold.

○ None of the two statements holds.

Question 24

1 / 1 pts

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

1st statement: All NP-intermediate problems are in PSPACE.

2nd statement: GRAPH ISOMORPHISM is an NP-intermediate problem.

◉ Only the 1st statement.

○ Only the 2nd statement.

○ Both statements.

○ None of the two statements.

Question 25

1 / 1 pts

Which one of the following statements holds?

1st statement: coNP ⊆ R.

2nd statement: Time complexity class coNP is the complement of time complexity class NP.

◉ Only the 1st statement holds.

○ Only the 2nd statement holds.

○ Both statements hold.

○ None of the two statements holds.

Question 26

1 / 1 pts

Which one of the following statements holds?

1st statement: REACHABILITY can be decided by a nondeterministic Turing machine in polynomial time.

2nd statement: REACHABILITY is recursively enumerable.

○ 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 can be stated being TRUE?

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

2nd statement: $SPACE(n^2) \subseteq NTIME(n^2)$

◉ Only the 1st statement.

○ Only the 2nd statement.

○ Both statements.

○ None of the two statements.

Incorrect

Question 28   0 / 1 pts

Which one of the following statements holds?

1st statement: Every type 2 language (according to Chomsky's hierarchy) can be recognized by a linear bounded automaton.

2nd statement: Every language which can be recognized by a linear bounded automaton is a type 2 language.

○ Only the 1st statement holds.

○ Only the 2nd statement holds.

○ Both statements hold.

◉ None of the two statements holds.

Incorrect

Question 29   0 / 1 pts

Which one of the following statements holds?

1st statement: Every language L, that can be generated by a type 1 grammar (according to Chomsky's classification) can be recognized by a nondeterministic Turing machine.

2nd statement: Every language L, that can be recognized by a nondeterministic Turing machine can be generated by a type 1 grammar.

○ Only the 1st statement.

○ Only the 2nd statement.

◉ Both statements.

○ None of the two statements.

Question 30   1 / 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: **21** out of 30