

Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

week 5

● Lecture 14: Boolean Circuits

● Lecture 15: Shannon's Theorem and Karp-Lipton-Sipser Theorem

● Lecture 16: Bounded Depth Circuit Classes

○ Quiz : Assignment 5

● Feedback For Week 5

● Assignment 5 Solution

week 6

Week 7

Week 8

week 9

Week 10

Week 11

Week 12

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Assignment 5

The due date for submitting this assignment has passed.

Due on 2021-02-24, 23:59 IST.

As per our records you have not submitted this assignment.

1) Let LC be the class of languages that can be decided by logspace-uniform circuit families. Which of the following statements are true? (\subsetneq represents strict subset) **1 point**

- $LC \subsetneq P$
- $P \subsetneq LC$
- $P = LC$
- P and LC are incomparable

No, the answer is incorrect.

Score: 0

Accepted Answers:

$P = LC$

2) Which of the following two statements are known to be true? **1 point**

(1) $NP \subseteq P/poly$

(2) $P/poly \not\subseteq NP$

- Only 1
- Only 2
- Both 1 and 2
- Neither 1 nor 2

No, the answer is incorrect.

Score: 0

Accepted Answers:

Only 2

3) For a positive integer n let $\text{bin}(n)$ be the smallest binary representation of n . Let L be a language such that $L \notin EXP$. Consider a language $L' = \{1^n \mid \text{bin}(n) \in L\}$. Which of the followings are true? **2 points**

- $L' \in P$
- $L' \in P/poly$
- $L' \in P/poly$ but $L' \notin P$
- $L' \in EXP$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$L' \in P/poly$

$L' \in P/poly$ but $L' \notin P$

4) A language A is sparse if there is a polynomial p such that $|A \cap \{0, 1\}^n| \leq p(n)$ for every $n \in \mathbb{N}$. Let L be a sparse language. Which of the following are known to be true? **2 points**

- $L \in P$
- $L \in NP$
- $L \in \text{non-uniform } NC$
- $L \in P/poly$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$L \in \text{non-uniform } NC$

$L \in P/poly$

5) Let C be the class of languages that can be solved by P -uniform circuit families of polynomial size and C' be the class of languages that can be solved by logspace-uniform circuit families. Which of the following is true? **2 points**

- $C' \subsetneq C$
- $C' = C$
- $C' = C \not\subseteq P/poly$
- $C \neq C'$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$C' = C$

6) Let L be a P -complete language. Which of the following two statements are true? **1 point**

(1) If $L \in NC$ then $P = NC$.

(2) If $P = NC$ then $L \in NC$.

- Only 1
- Only 2
- Both 1 and 2
- Neither 1 nor 2

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both 1 and 2

7) Which of the following two statements are true? **2 points**

(1) $NC^1 \subseteq DSPACE(\log^f n)$

(2) $NC^1 \subsetneq DSPACE(\log^{f+1} n)$

- Only 1
- Only 2
- Both 1 and 2
- Neither 1 nor 2

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both 1 and 2

8) Let A and B be two $n \times n$ matrices such that each entry of A and B is either 0 or 1. In binary matrix multiplication of two matrices, we replace each "+" with an OR operator and each "x" with an AND operator. What is the smallest complexity class to compute the binary matrix multiplication of two matrices? **2 points**

- NC^1
- NC^2
- AC^0
- AC^1

No, the answer is incorrect.

Score: 0

Accepted Answers:

AC^0