Assignment 11

The due date for submitting this assignment has passed.

Due on 2021-04-07, 23:59 IST.

As per our records you have not submitted this assignment.

1) Which of the following two statements are true? *5 points*

1. Each CNF formula computing the parity function requires exponential size.
2. Each DNF formula computing the parity function requires exponential size.

- Only 1
- Only 2
- Both 1 and 2
- Neither 1 nor2

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both 1 and 2

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

1. A nonzero polynomial of degree m over a field has at most m roots.
2. Two polynomials of degree at most m can agree on at most m values.

- 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

3) For a boolean function f and a set S of binary gates, we denote by $Size_S(f)$ the size of the smallest circuit that uses only gates in S to compute f. The size of the circuit is the total number of gates used (all of fanin at most 2), where we also consider the input variables as gates. Let a boolean function $g : \{0,1\}^n \to \{0,1\}$ be defined as being 1 iff at least two of its input variables are 1. Which of the following is known to be true? *5 points*

- $Size_S(f) = \Theta(n^2)$
- $Size_S(f) = \Theta(n \log n)$
- $Size_S(f) = \Theta(n)$
- $Size_S(f) = \Theta(1)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$Size_S(f) = \Theta(n)$

4) Let x and y be two integers given in binary representation and f be the integer addition function i.e. f(x,y)= x+y. Which of the following is known to be true? *5 points*

- f can be computed in AC^0
- f cannot be computed in AC^0
- f can be computed in NC^1 but not in AC^0
- f can be computed in NC^2 but not in NC^1

No, the answer is incorrect.
Score: 0

Accepted Answers:
f can be computed in AC^0

5) Let x and y be two integers given in binary representation and f be the integer multiplication function i.e. f(x,y)= x.y . Which of the following is/are known to be true? *5 points*

- f cannot be computed in AC^0
- Parity can be reduced to integer multiplication
- Parity and integer multiplication are incomparable
- f can be computed in AC^0

No, the answer is incorrect.
Score: 0

Accepted Answers:
f cannot be computed in AC^0
Parity can be reduced to integer multiplication

6) Which of the followings is/are not field? *2 points*

- Real Numbers
- Complex Number
- Odd integers
- Even Integers

No, the answer is incorrect.
Score: 0

Accepted Answers:
Odd integers
Even Integers

7) Given n integers $x_1, x_2, \ldots x_n$ given in binary representation, iterated integer addition f is defined as $f(x_1, x_2, \ldots, x_n) = x_1 + x_2 + \ldots + x_n$. Which of the following is known to be true? *5 points*

- f can be computed in AC^0
- f can be computed in NC^1 but not AC^0
- f can be computed in NC^2 but not NC^1
- f cannot be computed in NC

No, the answer is incorrect.
Score: 0

Accepted Answers:
f can be computed in NC^1 but not AC^0

8) Given n bits $x_1, x_2, \ldots x_n$ the MAJ function is defined as *5 points*

$$MAJ(x_1, x_2, \ldots x_n) = \begin{cases} 1, & \text{if } |\{x_i \mid x_i = 1\}| \geq \frac{n}{2} \\ 0, & \text{otherwise} \end{cases}$$

Which of the following is know to be true?

- MAJ can be computed in AC^0
- Parity reduces to MAJ
- MAJ cannot be computed in AC^0
- MAJ cannot be computed in NC^1

No, the answer is incorrect.
Score: 0

Accepted Answers:
Parity reduces to MAJ
MAJ cannot be computed in AC^0