Assignment 6

The due date for submitting this assignment has passed.

Due on 2021-03-03, 23:59 IST.

As per our records you have not submitted this assignment.

1) Consider the following statements: *2 points*

1. $\Sigma_2 \not\subseteq SIZE(n^k)$ for some fixed k
2. $\Sigma_2 \not\subseteq \bigcup_{k \in \mathbb{N}} SIZE(n^k)$

- Only statement (1) is true
- Only statement (2) is true
- Both statements are true
- Both statements are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
Only statement (1) is true

2) Mark the true statements: *2 points*

- $BPP = RP \cap co-RP$
- $BPP \subseteq RP \cup co-RP$
- $RP \cup co-RP \subseteq BPP$
- $BPP = co-BPP$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$RP \cup co-RP \subseteq BPP$
$BPP = co-BPP$

3) If $\{B_i\}_{i \in [k]}$ are k independent events each not occuring with probability p_i, then the probability that event $\bigwedge_{i \in [k]} B_i$ occurs is *2 points*

- $\Sigma_{i \in [k]} p_i$
- $\Sigma_{i \in [k]} (1 - p_i)$
- $\Pi_{i \in [k]} p_i$
- $\Pi_{i \in [k]} (1 - p_i)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\Pi_{i \in [k]} (1 - p_i)$

4) Alice has two balls that are identical except that one is red in colour and the other is blue. She wants to convice Bob who is colour blind, of the fact that there are two different coloured balls. Ofcourse, if Alice just asks Bob to trust her on this fact, he won't. She could lie. But since she is a student of complexity theory, she does not give up and comes up with the following way: *2 points*

She gives the two balls to Bob who holds a ball in each hand. Bob takes his hands behind his back and decides to either switch the balls between his hands or keep them as is with equal probability. Then he brings his hands out so that Alice can see and she has to "guess" whether Bob switched the balls or not. And they repeat this n times. Alice hopes that if she guesses correctly a lot of times, Bob will be convinced. What can you say about this protocol?

- If the balls are of different colour, then Alice can guess correctly all n times with probability 1
- If the balls are of different colour, then Alice can guess correctly all n times with probability $1/2^n$
- If the balls are of same colour, then Alice can guess correctly all n times with probability $1/2^n$
- If the balls are of same colour, then Alice can guess correctly all n times with probability 0

No, the answer is incorrect.
Score: 0

Accepted Answers:
If the balls are of different colour, then Alice can guess correctly all n times with probability 1
If the balls are of same colour, then Alice can guess correctly all n times with probability $1/2^n$

5) Suppose $BPP \subseteq PH$, then *2 points*

- If $P = BPP$, then $P = NP$
- If $P = NP$, then $P = BPP$
- If $P = BPP$, then $NP = coNP$
- If $NP = coNP$, then $BPP \subseteq NP$

No, the answer is incorrect.
Score: 0

Accepted Answers:
If $P = NP$, then $P = BPP$
If $NP = coNP$, then $BPP \subseteq NP$

6) Which of the following is/are known to be true? *2 points*

- $P \subseteq ZPP$
- $ZPP \subseteq P$
- $ZPP \subseteq NP$
- $NP \subseteq ZPP$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P \subseteq ZPP$
$ZPP \subseteq NP$

7) Suppose $X_1, \ldots, X_k$ are independent random variables with values in $\{0, 1\}$ and for every i, $Pr[X_i = 1] = p$. Then *2 points*

- $Pr\left[\left(\frac{1}{k}\sum_{i=1}^{k} X_i\right) - p > \epsilon\right] < e^{-\epsilon^2 \frac{k}{2p(1-p)}}$
- $Pr\left[\left(\frac{1}{k}\sum_{i=1}^{k} X_i\right) - p > -\epsilon\right] < e^{-\epsilon^2 \frac{k}{2p(1-p)}}$
- $Pr\left[\left(\frac{1}{k}\sum_{i=1}^{k} X_i\right) - p < \epsilon\right] < e^{-\epsilon^2 \frac{k}{2p(1-p)}}$
- $Pr\left[\left(\frac{1}{k}\sum_{i=1}^{k} X_i\right) - p < -\epsilon\right] < e^{-\epsilon^2 \frac{k}{2p(1-p)}}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$Pr\left[\left(\frac{1}{k}\sum_{i=1}^{k} X_i\right) - p > \epsilon\right] < e^{-\epsilon^2 \frac{k}{2p(1-p)}}$
$Pr\left[\left(\frac{1}{k}\sum_{i=1}^{k} X_i\right) - p < -\epsilon\right] < e^{-\epsilon^2 \frac{k}{2p(1-p)}}$

8) If there exists a Turing Machine that correctly decides a language for at least 95% of inputs of length n for all n, then that language is in BPP. *2 points*

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False