

Quiz - 3 (B)

Name: _____ Roll: _____ Sign: _____

Instructions

1. You have 30 minutes to answer all the questions in the space provided in the question paper.
2. Switch off your electronic devices and put them in your bag or pocket.
3. Please read all questions carefully before writing your answers. If you have any questions, do not discuss them with your neighbours; raise your hand we will come to you.

All The Best!

1. Let A represents bloom filter of users who uses in Facebook and B represents the bloom filter of users who uses Instagram. Let both bloom filter uses the same hash functions, then to check if a user x is in both Facebook and Instagram we check $C[h_1(x)] \wedge C[h_2(x)] \wedge C[h_3(x)]$, where C is a bloom filter as follows. [2 marks]

<input type="checkbox"/> $C = \sim(A \cup B)$	<input type="checkbox"/> $C = A \text{ xor } B$	<input checked="" type="checkbox"/> $C = A \wedge B$	<input type="checkbox"/> $C = A \cup B$
-----------------------------------------------	-------------------------------------------------	------------------------------------------------------	-----------------------------------------

2. In a d -dimensional space, the number of vectors which are mutually orthogonal to each other are, i.e., for every pair (x, y) , $\langle x, y \rangle = 0$. [2 marks]

<input checked="" type="checkbox"/> d	<input type="checkbox"/> $d-1$	<input type="checkbox"/> $O(2^d)$	<input type="checkbox"/> $O(d^2)$
-----------------------------------------	--------------------------------	-----------------------------------	-----------------------------------

3. If x and y be two independent random vectors from $\mathcal{N}(0, I_d)$, then what is

$$\mathbb{E}[\|x - y\|_2^2] \quad [2 \text{ marks}]$$

<input checked="" type="checkbox"/> $2d$	<input type="checkbox"/> $O(2^d)$	<input type="checkbox"/> 0	<input type="checkbox"/> d
------------------------------------------	-----------------------------------	------------------------------	------------------------------

4. Consider, m points in \mathbb{R}^n . Let A be a random JL matrix such that for every pair (x, y) we have the following with at least 0.99 probability.

$$(1 - \varepsilon)\|x - y\|_2^2 \leq \|Ax\|_2^2 - \|Ay\|_2^2 \leq (1 + \varepsilon)\|x - y\|_2^2$$

Let $\varepsilon = 0.5$, then what is the dimension of A ? [2 marks]

<input checked="" type="checkbox"/> $O(\log(m)) \times n$	<input type="checkbox"/> $m/2 \times n$	<input type="checkbox"/> $m \times n$	<input type="checkbox"/> $O(\log(n)) \times n$
-----------------------------------------------------------	-----------------------------------------	---------------------------------------	------------------------------------------------

5. In a d -dimensional space, the number of vectors which are mutually orthogonal to each other are, i.e., for every pair (x, y) , $\langle x, y \rangle \leq 0.1$. [2 marks]

<input type="checkbox"/> $O(d^2)$	<input type="checkbox"/> d	<input type="checkbox"/> $d-1$	<input checked="" type="checkbox"/> $O(2^d)$
-----------------------------------	------------------------------	--------------------------------	----------------------------------------------