Student Name:

CS2223: D-Term 2017
Quiz 1

Note: If you need to use a known algorithm, e.g., linear search, binary search, merge sort, etc. inside your pseudocode, then just mention its name without details.

Question 1 (Algorithm Design) [8 Points]

Given an array N (rows) x M (columns), where the values in each row are unique and sorted in an ascending order, but the values in each column are not sorted.

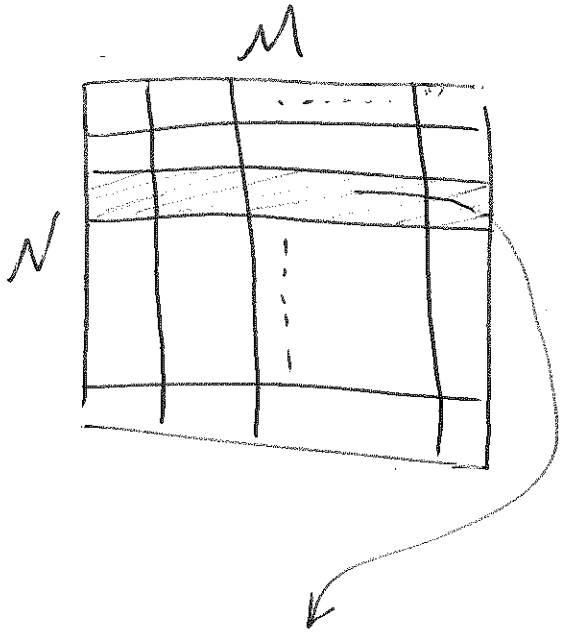
(a) [4 Points] Write an efficient pseudocode to search for a value *K* in the array (*K* may appear in several rows).

(b) [4 Points] State the time complexity of the proposed algorithm

For $i = 1$ To N loop ..

- do Binary Search in The row i for value K.

END loop



$O(N \log M)$

Question 2 (Big-O, Θ, Ω) [8 Points]

(a) [4 Points] Write the Big O complexity (tight bound) for the following

$5n^2 + 10\ n \text{ Log } n + 100$ → $O(n^2)$

$NM + 100P + N^2M + \text{Log } P$ → $O(N^2M + P)$

(b) [4 Points] True or False

If $f(n)$ is $\Theta(n^3)$, then $f(n)$ can be $f(n) = n^4 + 100n^3 + 100\ n \text{ Log } n$ ✗

If $f(n) = n^2 \text{Log } n + 100\ n$, then $f(n) = \Omega(n \text{ Log } n)$ & $f(n) = O(n^3)$ ✓

Question 3 (Complexity Analysis) [4 Points]

What is the Big O complexity of the following function?

```
For i  = 1  to Log n  Loop
     - Search (efficiently) in a sorted list of size m for value i
End Loop
For i  = 1 to m Loop
     - If i is odd Then print i;
End Loop
```

First loop ⟹ $O(\log n * \log m)$

Second loop ⟹ $O(m)$

Total Complexity ⟹ $O(\log n * \log m + m)$