CS2413- Data Structures

Fall Semester 2016

Department of Computer Science

Texas Tech University

Programming Contest

Rule: Only complete and correct and runnable program would be acceptable and consider for grading.
Rule: You may use online resources, papers, articles and books also your textbook contains C++ source codes that you may use.
Rule: Select an appropriate data structure which will be efficient and effective for the purpose of the problem.
Rule: The entire competition is 2 hours and 15 minutes. You don't need to comment the code nor analyze the time complexity.
Rule: The first team who finishes and gives a working program with correct logic will be the winner.
Rule: If no one finishes by the end of the competition, the team with the most complete and correct logic will be the winner.

Problem: Develop and analyze a data structure to maintain a **set** of disjoint intervals of the form [a, b) such that a, b $\in$ N (N is set of all natural numbers). Your data structure should support the following operations:

- **make(a, b) :** Create the interval [a, b) (must not overlap existing intervals).

- **Merge(a, b, c) :** Merge the adjacent intervals [a, b) and [b, c) into [a, c). After merging, the number of elements in the set of intervals needs to decrease by 1.

- **split(a, b, k)** : For k $\in$ [a, b), split the interval [a, b) into [a, k) and [k, b). After splitting, the number of elements in the set of intervals needs to increase by 1.

- **catch(k) :** Return the interval [a, b) that contains k, or report that no interval contains k.