



## Lab 3 Sets and Bits Manipulation

### 1 Part 1: Basic Bit Operations

You have to implement 4 bits operations, so your program might allow user to choose one of the following operations.

1. **getBit(int number, int position):** This function returns the bit value (an integer, 0 or 1) in the number at position *position*, according to its binary representation. The least significant bit in a number is position 0.
2. **setBit(int number, int position):** This function set the bit value ( to be 1) in the number at position *position*, according to its binary representation. The least significant bit in a number is position 0 and return number after setting the bit.
3. **clearBit(int number, int position):** This function cleat the bit value ( to be 0) in the number at position *position*, according to its binary representation. The least significant bit in a number is position 0 and return number after clearing the bit.
4. **updateBit(int number, int position, boolean value):** This function set the bit value according to value parameter which is false (0) or true (1) in the number at position *position*, according to its binary representation. The least significant bit in a number is position 0 and return number after update.

### 2 Part 2: Sets Operations using Bits Manipulation

1. Implement a Set data structure that takes in the constructor a **list of strings as a Universe (U)**. The elements in the Set are subset of U. **You must use bits to represent the set.** The Set data structure should include the main operations:
  - 1) Add string to the set
  - 2) Union with another set
  - 3) Intersection with another set
  - 4) Complement of the set
  - 5) Difference from another set
  - 6) Cardinality of the set
  - 7) Get elements of the set



2. Write a program that.

- (a) Asks the user to enter a list of strings as a Universe (U)
- (b) Then asks for a number of sets (that are subsets of U). The user will enter the elements in each set
- (c) Then asks the user about the operations they want to perform:
  - 1) Union of two sets
  - 2) Intersection of two sets
  - 3) Complement of a set
  - 4) Difference between two sets
  - 5) Cardinality of a set
  - 6) Print a set

### 3 Submission

- You must work **in groups of two** and use **Java programming language** in your implementation.
- You should deliver all the coding files (.java) along with a detailed report.
- The report should contain:
  1. Team names and ids
  2. Problem statement.
  3. Used data structures.
  4. Sample runs and different test cases.
  5. Assumptions and details you find necessary to be clarified.

**Good Luck,,,**