Alexandria University
Faculty of Engineering
Computer and Systems Engineering Department

CS214: Discrete Structures
Assigned: November 30, 2025
Due: December 07, 2025

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

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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,,,

Eng. Ahmed El-Sayed Mahmoud