SE LAB TASK - 2

Problem Statement: Student Result Processing System

1. Modularization

The program is modularised by creating a header file that contains all the utility functions that are necessary to perform the operations to complete the given task. The details of the module is as follows:

- **Module Name:** UTILS
- **Header File:** utils.h
- **Implementation File:** utils.c

2. Module Specifications

Structures:

- **struct Subject (40B):** Stores individual subject details including name, marks (minor/major), total, grade, and points.
- **struct Student (256B):** Contains student identification, an array of 5 Subject structures, and aggregate totals (Grand Total, Percentage, CGPA).

Function: readStudentData

- **Module Name:** UTILS
- **Input:** char* filename (source data), int* count (to store number of records)
- **Pre-condition:** Input file must exist and contain data in the specified format.
- **Logic (Algorithm):**
    1. Open the input file for reading.
    2. Initialize a dynamic array for Student records.
    3. While reading the file: a. Extract Student ID and Name. b. Validate the Name (check for alphabets) and ID (check for uniqueness). c. For each of the 5 subjects: i. Read subject name and marks. ii. Calculate Total = Minor + Major. iii. Determine Grade and Grade Points based on the Total. d. Calculate aggregate values: Grand Total, Percentage, and CGPA. e. Increment count and expand memory using realloc.
    4. Close file.
    5. Return the pointer to the student array.
- **Output:** Returns a pointer to the allocated Student array.

Function: printStudentData

- **Module Name:** UTILS
- **Input:** char* filename, Student* students, int count

- **Logic (Pseudocode):**
    1. Open output file for writing.
    2. Write a formatted header line (ID, Name, Subjects, CGPA).
    3. Loop through the students array:
        - Print the student’s basic info and each subject's breakdown.
        - Print the final calculated CGPA and Grade.
    4. Calculate class-wide statistics (Average CGPA, High/Low score).
    5. Print frequency distribution of grades (A+, A, B, etc.).
    6. Close file.