Addis Ababa Science and Technology University
Department of Software Engineering

Fundamentals of Programming I
Group Assignment V (Project Work III)

Instruction: Analyze the problem given below, and (b) draw *flow chart* and write a *pseudo-code* to describe the algorithm that you apply to solve the following problem and then transform the algorithms into *program*.

1. Ethiopian meteorology agency wants an application that records the high and low temperatures for each day of all months of for the year 2010. The agency requests you to design the application using three-dimensional weather array by which the months, days and daily (low, high, average) temperatures represented. The months are labeled by the numbers 1 to 12, the date of the months are numbered 1 through 31 representing the days, and three columns labeled H and L, representing the day's high, low and average temperatures. Use this information to develop a program that records the high and low temperatures for each day of all months and then allow the user to request the following:

   ▪ Any day's high and low temperature.

   ▪ Any month high, low and average temperatures for a given month

   ▪ Month and day with the highest temperature

   ▪ Month and day with the lowest temperature.

   ▪ All months average temperature to be printed in table format

2. (**Total Sales**) A company has four salespeople (1 to 4) who sell five different products (1 to 5). Once a day, each salesperson passes in a slip for each different type of product sold. Each slip contains the following:

   a) The salesperson number
   b) The product number
   c) The total Birr value of that product sold that day

Thus, each salesperson passes in between 0 and 5 sales slips per day. The program records the above daily information and generates a summary of the total sales by each salesperson per product. At the end of every month, the program prints the results in tabular format with each of the columns representing a particular salesperson and each of the rows representing a particular product. Cross total each row to get the total sales of each product for last month; cross total each column to get the total sales by salesperson for last month. Your tabular print out should include these cross totals to the right of the totaled rows and to the bottom of the totaled columns. Also the company wants the program to calculate the bonus payment each salesperson receives at the end of the month and print it at the bottom of the column. The company pays a 5% bonus to each of its salespeople based on the amount of sales he/she made during the previous month. Using the information given here write an application to solve the problem of the company. Also the program allow to search for particular product or salesperson record.

3. **(Airline Reservations System)** A small airline has just purchased a computer for its new automated reservations system. You've been asked to program the new system. You are to write a program to assign seats on each flight of the airlines only plane (capacity: 100 seats). Your program should display the following menu of alternatives: Please type 1 for "First Class" and Please type 2 for "Economy". If the person types 1, your program should assign a seat in the first class section (seats 1–30). If the person types 2, your program should assign a seat in the economy section (seats 31–100). Your program should print a boarding pass indicating the person's seat number and whether it's in the first class or economy section of the plane. Your program should, of course, never assign a seat that has already been assigned. When the first class section is full, your program should ask the person if it's acceptable to be placed in the economy section (and vice versa). If yes, then make the appropriate seat assignment. If no, then print the message "Next flight leaves in 3 hours." The program must request the person to input his/her name, sex, age and passport number (unique and makes the person searchable when necessary).

   Note: - You are free to add more features than what described in the given problem above. For example you may have your own seat design for the given number of seats both for "First class" and "Economy section".

4. Write a program that reads in the average monthly rainfall for Addis Ababa city for each month of the year and then reads in the actual monthly rainfall for each of the previous 12 months. The program then prints out a nicely formatted table showing the rainfall for each of the previous 12 months as well as how much above or below average the rainfall was for each month. The average monthly rainfall is given for the months Meskerem, Tikimt, and so forth, in order. To obtain the actual rainfall for the previous 12 months, the program first asks what the current month is and then asks for the rainfall figures for the previous 12 months. The output should correctly label the months. The program also outputs a bar graph showing the average rainfall and the actual rainfall for each of the previous 12 months. There should be two bar graphs for each month and they should be labeled as the average rainfall and the rainfall for the most recent month. Your program should ask the user whether she or he wants to see the table or the bar graph and then should display whichever format is requested. The program should also allow the user to see either format as often as the user wishes until the user requests that the program end. Moreover, allow the user to search for specific month and see the result in both table format and bar graph.

5. Software Engineering department head needs a program that read in student ID and mark of all the subjects they are taking in this semester. The program should compute average mark and find an equivalent grade letter of each mark scored by the student in every subject he/she is taking. Additionally the program read in the credit hours of each subjects and should compute the CGPA (cumulative grade point average) of all student. The CGPA is calculated using the following formula:

$$\sum (\text{Grade letter point} * \text{credit hour}) / \text{total credit hour}$$

Write an application that print the student's mark sheet in the following format and also the program allows the Head of Department to search for specific student or to see top five (5) ranked students.

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                        STUDENT'S MArk SHEET

Stud. ID          Int. SWEG          FoP I          Calculas      Average   CGPA
               Mark : Grade      Mark : Grade    Mark : Grade

ets001/11        78 : B            95 : A          76 : B          83       3.67
ets002/11        57 : C            98 : A          76 : B          77       3.5
ets003/11        74 : B            59 : C          86 : A          73       3.5
ets004/11        87 : A            96 : A          75 : B          86       3.83
ets005/11        87 : A            96 : A          75 : B          86       3.83
ets006/11        74 : B            85 : A          68 : C          75.7      3.5
ets007/11        69 : C            78 : B          64 : C          70.3     3.17
```

Hint: - use the following grading scale and its equivalent grade pint

Mark out of 100 %	>= 85	>=75	>= 70	>= 60	>= 50	>= 40	< 40
Grade Letter	A	B+	B	C+	C	D	F
Grade letter point	4	3.5	3	2.5	2	1.5	0

6. A small business owner wants to track his/her customer. The owner requires a program that read details of his customer (like name, sex and address). The owner also needs to assign each customer a code (starting at 0). Whenever a customer purchases something, the program checks if the customer is new or not. If he/she is new customer the program first add his/her details to the system and assign a code. Once the customer registered the program record the sale in the element that matches the customer's number (that is, the next unused array element). When the store owner signals the end of the day, print a report consisting of each customer details and customer number with its matching sales, a total sales figure, and an average sales figure per customer in tabular form. Also the owner wants the program to allow him/her to search for particular customer by id or name. Using the requirement given develop an application that the business owner wants.

7. Abebe, Haile, Kenanisa, Derartu, and Tirunesh are preparing for an upcoming marathon. Each day of the week, they run a certain number of miles and write them into a notebook. At the end of the week, they would like to know the number of miles run each day, the total miles for the week, and average miles run each day. And they need a program to help them to analyze their data. Design a program that must contain parallel arrays to store the number of miles run by each runner each day. Furthermore, your program must able to perform the following: read and store the runners' names and the numbers of miles run each day; find the total miles run by each runner and the average number of miles run each day; and output the results. (You may assume that the output data have the following form): Also the program should allow to search for specific runner by his/her name or code.

Runner Name	Miles Day1	Miles Day2	Miles Day3	Miles Day4	Miles Day5	Miles Day6	Miles Day7	Total Miles
Runner 1								
Runner 2								
- - - - - - --								
-- - - - - - - -								
Runner N								
Average miles run each day								

8. A company pays its employees as managers (who receive a fixed weekly salary), hourly workers (who receive a fixed hourly wage for up to the first 40 hours they work and "time-and-a-half" 1.5 times their hourly wage for overtime hours worked), commission workers (who receive 250 ETB plus 5.7 percent of their gross weekly sales), or pieceworkers (who receive a fixed amount of money per item for each of the items they produce each pieceworker in this company works on only one type of item). Write a program to compute the weekly pay for each employee. You do not know the number of employees in advance. Each type of employee has its own pay-code: Managers have code 1, hourly workers have code 2, commission workers have code 3 and pieceworkers have code 4. Use more appropriate selection structure to compute each employee's pay according to that employee's pay-code. The program should prompt the user (i.e., the payroll clerk) to enter the appropriate facts your program needs to calculate each employee's pay according to that employee's pay-code. Finally, the program prints the weekly pay of the employees in tabular format. Also the program allows the user to search for specific record.

9. Design a program to manage at least 100 bank accounts. The accounts numbers are begin from 1001 and range up to required number of accounts. There are several types of transactions, which the program will read. If allowed, the program may modify the account

balance. Otherwise a warning message will be printed. The dialogue for the transactions have the following forms:

Interaction	Explanation
Transaction type?: O **Initial deposit?:** amount	• Open an account, giving the initial deposit. • Allowed if less than 100 accounts now open. • Prints the new account number.
Transaction type?: B **Account number?:** account_number	A Balance inquiry prints the account number and the balance, only allowed if the account is open.
Transaction type?: D **Account number?:** account_number **Amount?:** amount	A Deposit prints the account number and new balance, only allowed if account opens.
Transaction type?: W **Account number?:** account_number **Amount?:** amount	• A Withdrawal, only allowed if account open and sufficient funds available, • Prints account number and new balance.
Transaction type?: C **Account number?:** account_number	Close the account. Only allowed if account is open.
Transaction type?: I **Interest rate?:** interest_rate	Compute interest at given % rate and apply to all accounts
Transaction type?: P	• Print all the account numbers and amounts or • Print the account and all corresponding transaction in tabular format.
Transaction type?: E	Close all accounts and exit program

In the above table, the bold type represents questions the program asks the user. Each response to the *transaction type* question is a single character as given in the table. Any attempted illegal transaction causes an error message. Amounts are in ETBs and can have 0, 1 or 2 digits after the point like 2765 or 123.4 or 8864.57:

Add pin numbers to the bank accounts and add a special pin number for the bank manager. Add a transaction type S to open the bank. Only the manager should be allowed to do transactions S, P, I, and E. For each transaction, the computer must ask for the pin number. In an Open transaction, the user chooses the pin number for the account.

10. Your English teacher needs help in grading a True/False, Multiple, and short answers test. The test answer stored in 1D array and the students' IDs and test answers are stored in 2D

array. The first entry in the student array contains students' IDs and other entries in the array are student's answers to the question. The exam has 20 questions, and the class has more than 150 students. <mark>Each correct answer is awarded two points, each wrong answer gets one point deducted</mark>, and no answer gets zero points. The program processes the test data and should display the student's ID, followed by the answers, followed by the test score, followed by the test grade. When it is required the program should print the 5/10 top test scores along with the student's ID in order the top score first and forth. The program should allow your teacher to search for a student with his/her id.

Assume the following grade scale:

Mark out of 100 %	90%–100%	80%–89.99%	70%–79.99%	60%–69.99%	%–59.99%
Grade Letter	A	B	C	D	F