NAME : Etcherla Sai Manoj MIS.NO : 112015044
BRANCH : CSE

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DSA LAB = 1

Algorithms

pre: initialization

Step 1 : Start
Step 2 : Initialize a variable n.
Step 3 : Input value of n
Step 4 : Initialize a character array name of size n.
Step 5 : Initialize an integer array marks of size n
Step 6 : Initialize variable i = 0
Step 7 : Repeat the steps until i < n
    7.1 : Input name to name array
    7.2 : Input marks of corresponding student to marks array
    7.3 : i = i + 1

i) average of examination marks

Step 1 : Start
Step 2 : Initialize variable sum = 0 and average.
Step 3 : Initialize variable i = 0
step 4 : Repeat steps until i < n
    4.1 : Summation of all marks Sum = Sum + marks[i]
    4.2 : i = i + 1
Step 5 : Average = Sum / n
Step 6 : Print value of average
Step 7 : Stop

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ii) displaying names of all students whose score is below average score

step 1 : start
step 2 : Initialize variable i=0
step 3 : Repeat the steps until i<n
    3.1 : if marks[i] < average
        print corresponding student name
        print corresponding student marks
    3.2 : i= i+ 1
step 4 : Stop

iii) calculate highest examination score

step 1 : start
step 2 : Initialize variable i=0 and max_score=0
step 3 : Repeat the steps until i<n
    3.1 : if max_score ≤ marks[i]
        Assign marks[i] value to max_score
    3.2 : i= i+1
step 4 : Print value of max_score
step 5 : Stop

iv) display names of all students who scored equal to highest score

step 1 : start
step 2 : Initialize variable i=0
step 3 : Repeat steps until i<n
    3.1 : if marks [i] = max_score
            print corresponding student name
    3.2 : i = i + 1
step 4 : stop

Theory

1)A. Programming is a process of problem solving. It is a way to instruct the computer to perform various tasks. It can also be said it is a language containing set of instructions to implement algorithms and produce various kinds of output.

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2) A. Algorithm is step by step problem solving process where solution is generated in finite amount of time. These are set of instructions that are followed step-by-step in process of problem solving.

3) A. There are two broad categories of software. They are
i) System software
ii) Application software

i) System software contains programs that are responsible for managing the computer such as
a) Assembler
b) compiler
c) Linker & Loader
d) Interpreter
e) Text editor
which in turn helps operating system run smoothly and perfectly.

ii) Application software is the one which perform specific tasks that are specified/required to the user. The tasks can be personal, educational and business purpose. some examples are MS word, MS excel, web browsers etc.

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4) A. Basic builind blocks of c++ program:

a) variables — a, name,

b) operaters — +, −, *, /, %

c) identifiers — reserved words

d) comments — // this is c++ program

e) data types — int, float, double, char

f) statments — Declaration statements, execution statements

g) Library — #include <library name>

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5) A. Problem solving consists mainly 3 steps.

a) Analyzing the problem
b) Implementing the problem
c) Maintaining the problem

a) Step 1: Analyzing the problem

- Think of a blueprint on how to solve the problem
- write pseudocode/algorithm to solve the problem
- if program is complex divide it into sub programs and write algorithm

Step 2: Implementing the problem

- Implement the algorithm and check correctness
- If algorithm works write code in high-level language
- Implement the algorithm in code
- Run the code and verify algorithm works.

Step 3: Maintenance of Problem

- Write code in such a way that can be easily updated for future purposes.
- Use and modify the problem if problem domain changes

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6) A. Analysis phase of programming is done by the compiler. It contains 6 phases.

1) Lexical analysis
2) syntax analysis
3) Semantic analysis
4) Intermediate code generation
5) Code optimization
6) Final code generation.

First 3 phases carry out the main analysis of the program.

1) Lexical analysis:

Here tokenization is done, program is divided into blocks ~~(or) tokens~~ called lexemes (or) tokens. These lexemes are keywords, identifier, terminal etc.

2) Syntax analysis:

The analyzed lexemes are brought as input here to check syntax of the language i.e., basic grammar rules to writhe the program in a language.

3) Semantic analysis:

The analyzed code after syntax analysis is input here for further analysis of meaning of the program.