Ministerul Educației și Cercetării al Republicii Moldova

Universitatea Tehnică a Moldovei

Departamentul Ingineria Software şi Automatică

RAPORT

(în limba engleză)

Lucrarea de laborator nr. _
la Programarea Calculatoarelor

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Laboratory work # X

Topic: Computer Programming of Linear Structure Algorithms

Purpose of the laboratory work: Accumulation of practical skills for developing and programming linear computational processes and program testing skills.

Problem condition [1] **:** Calculate values of two expressions according to given formulas and initial data. Output the result on the screen

Variant 16:

Calculation formulas:

$S=(1+ \ln(a)/(2+\cos^3 x^2)) /(2x-y^5)$

$W=a^{-tx}-\sqrt{|yt+x|}+ \operatorname{ctg}(ax+y)$

Initial data values:

a = 0.45

y = -2.1

x = 3

t = 1.5

Laboratory work processing:

Short theory on laboratory work topic:

In Computer Programming an algorithm is a finite set of operations (actions) for solving a problem on computer. There are several forms of algorithm representation [2]:

- natural form;
- graphic form;
- pseudocode;
- program written in a programming language.

Algorithm with linear structure is characterized by the absence of decision operations [2].

The general structure of a C language program is as follows [2 - 4]:

- preprocessor directives (if necessary);
- declaration of global variables and user functions (if necessary);
- code of the **main()** function ;
- codes of user functions (if necessary).

Structure of a function in C language [2 - 4]:

1. **Function header**, or first line of function code, which consists of 3 elements:

a) function type; b) function name; c) list of types and names of function parameters written in round brackets.

2. **Function body** written within braces {...}.

Description of data (variables):

a) input data:

a, y, x, t - simple variables of real type, parameters of formulas (to be entered from the keyboard).

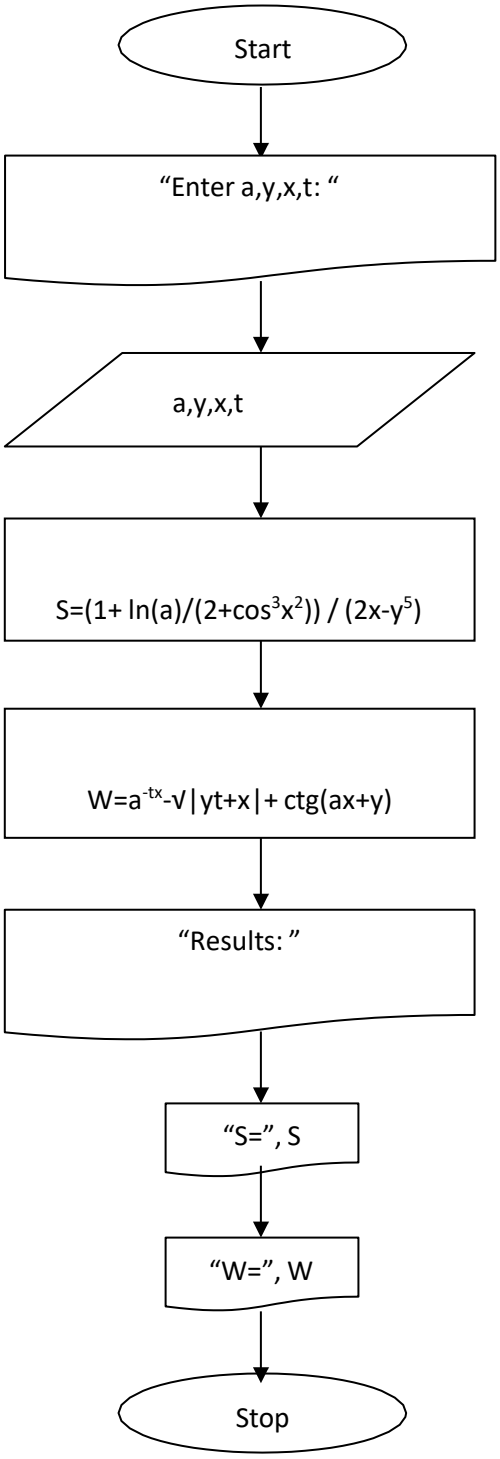
b) output data:

S, W - simple variables of real type, the values of the calculation formulas (to be displayed on the screen).

c) working data: not used in this program.

Algorithm description:

Flowchart of the algorithm (optional):



Program code (text) in C language (listing of the program):

```
#include <stdio.h>
#include <math.h>

int main ()
{
float a, y, x, t;
float S, W;
printf ("Enter input data a, y, x, t:");
scanf ("%f%f%f%f", & a, & y, & x, & t);
S = (1+ log(a) / (2 + pow(cos(x * x), 3))) / (2 * x-pow(y, 5));
W = pow(a, -t * x) -sqrt(fabs(y * t + x)) + 1 / tan(a * x + y);
printf ("\t Results: \ n");
printf ("S =%.3f \n", S);
printf ("W =%f \n", W);
return 0;
}
```

Results of running and testing the program (screenshots) **:**

```
Enter input data a, y, x, t: 0.45 -2.1 3 1.5

           Results:
S = 0.008
W = 34.892567
```

Verification of the results:

WolframAlpha online application [5] can be used to verify the results of this laboratory work.

(Screenshots from WolframAlpha)

Analysis of results and conclusions:

1. Have been developed skills to compile, run and test a simple program in the C programming language.
2. The verification of the results confirms that the elaborated program works correctly.
3. Linear algorithms can be used to calculate mathematical expressions.
4. The advantage of the developed program is the simplicity of implementing the linear algorithm.
5. The developed program does not verify the input data, which is a disadvantage of the algorithm.
6. The developed program can be further developed by adding input verification operations.

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Bibliography:

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