МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

### федеральное государственное автономное образовательное учреждение высшего образования

«САНКТ-ПЕТЕРБУРГСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ АЭРОКОСМИЧЕСКОГО ПРИБОРОСТРОЕНИЯ»

(ГУАП)

КАФЕДРА ВЫЧИСЛИТЕЛЬНЫХ СИСТЕМ И СЕТЕЙ

Преподаватель

канд. техн. наук, доцент Л.Н. Бариков

Отчёт

по лабораторной работе №1

по дисциплине ОСНОВЫ ПРОГРАММИРОВАНИЯ

на тему: «Следование»

Работу выполнил

студент гр. 4941 Н.С. Горбунов

Санкт-Петербург

2020

**Цель лабораторной работы**: изучение концепций и освоение технологии структурного программирования, приобретение навыков структурного программирования на языке C/C++ при решении простейших вычислительных задач.

**Задание на программирование**: используя технологию структурного программирования разработать линейную программу решения индивидуальной вычислительной задачи (выполнение поразрядных логических операций над целыми числами).

**Задание 13**

Выполнить поразрядные логические операции над целыми числами:

249 **˄** 11

-249 **∆** 11

249 **>>** 2

249 **˅** -13 **˄** (34 **˅** **¬**46)

**Математическая модель (ручной счёт)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2 | | 4 | | 9 | | 2 | |  | |  |  |  |  |  |  |  |  |  |  |
| 2 | |  | |  | | 1 | | 2 | | 4 | 2 |  |  |  |  |  |  |  |  |
| 0 | | 4 | |  | | 1 | | 2 | |  | 6 | 2 | 2 |  |  |  |  |  |  |
|  | | 4 | |  | |  | | 0 | | 4 | 6 |  | 3 | 1 | 2 |  |  |  |  |
|  | | 0 | | 9 | |  | |  | | 4 | 0 | 2 | 2 |  | 1 | 5 | 2 |  |  |
|  | |  | | 8 | |  | |  | | 0 |  | 2 | 1 | 1 | 1 | 4 | 7 | 2 |  |
|  | |  | | 1 | |  | |  | |  |  | 0 | 1 | 0 |  | 1 | 6 | 3 | 2 |
|  | |  | |  | |  | |  | |  |  |  |  | 1 |  |  | 1 | 2 | 1 |
|  | |  | |  | |  | |  | |  |  |  |  |  |  |  |  | 1 |  |
| 1 | 1 | | 2 | |  | |  | |
| 1 | 0 | | 5 | | 2 | |  | |
|  | 1 | | 4 | | 2 | | 2 | |
|  |  | | 1 | | 2 | | 1 | |
|  |  | |  | | 0 | |  | |

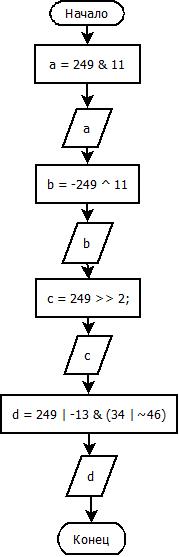
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | 3 | 2 |  |  |
| 1 | 2 | 6 | 2 |  |
|  | 1 | 6 | 3 | 2 |
|  |  | 0 | 2 | 1 |
|  |  |  | 1 |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | | 4 | | 2 | |  | |  | |  | | |  | |  | |
| 2 | |  | | 1 | | 7 | | 2 | |  | | |  | |  | |
| 1 | | 4 | | 1 | | 6 | | 8 | | 2 | | |  | |  | |
| 1 | | 4 | |  | | 1 | | 8 | | 4 | | | 2 | |  | |
|  | | 0 | |  | |  | | 0 | | 4 | | | 2 | | 2 | |
|  | |  | |  | |  | |  | | 0 | | | 2 | | 1 | |
|  | |  | |  | |  | |  | |  | | | 0 | |  | |
| 4 | 6 | | 2 | |  | |  | |  | |  |  | |  | |
| 4 |  | | 2 | | 3 | | 2 | |  | |  |  | |  | |
| 0 | 6 | | 2 | |  | | 1 | | 1 | | 2 |  | |  | |
|  | 6 | | 0 | | 3 | | 1 | | 0 | | 5 | 2 | |  | |
|  | 0 | |  | | 2 | |  | | 1 | | 4 | 2 | | 2 | |
|  |  | |  | | 1 | |  | |  | | 1 | 2 | | 1 | |
|  |  | |  | |  | |  | |  | |  | 0 | |  | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2 | 4 | 9 | = | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| — | 2 | 4 | 9 | = | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
|  |  | 1 | 1 | = | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
|  | — | 1 | 3 | = | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |
|  |  | 3 | 4 | = | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
|  |  | 4 | 6 | = | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 | 4 | 9 | = | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 1 | = | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 2 | 4 | 9 | A | N | D | 1 | 1 | = | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | = | 9 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | — | 2 | 4 | 9 | = | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 1 | = | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | — | 2 | 4 | 9 | X | O | R | 1 | 1 | = | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | = | 1 | 2 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 | 4 | 9 | = | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | 2 | 4 | 9 | >> | 2 | = | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | = | 6 | 2 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 4 | 6 | = | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | N | O | T | 4 | 6 | = | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 | 4 | = | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | N | O | T | 4 | 6 | = | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 3 | 4 | O | R | N | O | T | 4 | 6 | = | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | — | 1 | 3 | = | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | 3 | 4 | O | R | N | O | T | 4 | 6 | = | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  |  | — | 1 | 3 | A | N | D | 3 | 4 | O | R | N | O | T | 4 | 6 | = | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 | 4 | 9 | = | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |  |  |  |  |
|  |  |  |  |  | — | 1 | 3 | A | N | D | 3 | 4 | O | R | N | O | T | 4 | 6 | = | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |  |  |  |  |
| 2 | 4 | 9 | O | R | — | 1 | 3 | A | N | D | 3 | 4 | O | R | N | O | T | 4 | 6 | = | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | = | 2 | 5 | 1 |

**Блок-схема алгоритма:**



**Текст программы**

#include <iostream>

#include <stdio.h>

int main()

{

unsigned char a, b, c, d;

a = 249 & 11;

printf( "249 AND 11 = (9) = %i \n" , a);

b = -249 ^ 11;

printf ("-249 XOR 11 = (12) = %i \n ", b);

c = 249 >> 2;

printf ("147 >> 2 = (62) = %i \n", c);

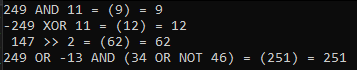
d = 249 | -13 & (34 | ~46);

printf( "249 OR -13 AND (34 OR NOT 46) = (251) = %i \n" ,d);

return 0;

}

**Пример работы программы**

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**Вывод:** используя технологию структурного программирования разработал линейную программу решения индивидуальной вычислительной задачи (выполнение поразрядных логических операций над целыми числами).