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Факультет інформатики та обчислювальної техніки
Кафедра інформатики та програмної інженерії

Звіт
з лабораторної роботи № 2 з дисципліни
«Основи програмування 2. Методології програмування»
«Файли даних. Бінарні файли»

Варіант __16__

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Лабораторна робота 2

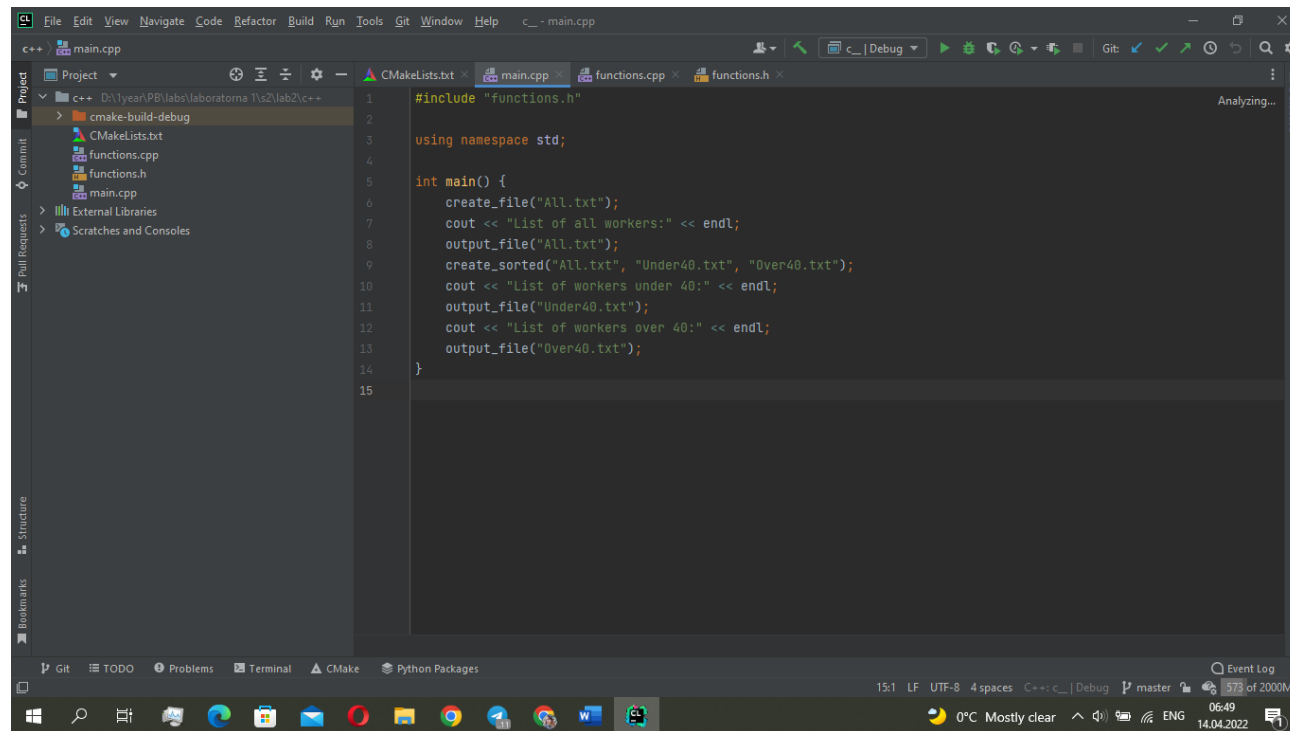
Мета – вивчити особливості створення і обробки бінарних файлів даних.

Індивідуальне завдання

Варіант 16

16. Створити файл із списком співробітників підприємства: ПІБ працівника, його дата народження (ДД.ММ.РРРР), табельний номер, стать (чоловік / жінка). При додаванні даних виконувати перевірку на вік: він повинен бути не менше 20-ти та не більше 60-ти років. Створити два нових файли: перший містить список працівників, яким не більше 40 років, другий – список інших працівників.

Виконання на C++



The screenshot shows a C++ IDE with a project named 'c++' and a file 'main.cpp' open. The code in 'main.cpp' includes 'functions.h' and uses the 'std' namespace. The 'main' function calls 'create_file' to create 'All.txt', then 'create_sorted' to create 'Under40.txt' and 'Over40.txt'. It also uses 'cout' to display the list of workers under 40 and over 40. The IDE interface includes a sidebar with project files, a terminal, and a status bar at the bottom showing the current file, line, column, and encoding.

```
1 #include "functions.h"
2
3 using namespace std;
4
5 int main() {
6     create_file("All.txt");
7     cout << "List of all workers:" << endl;
8     output_file("All.txt");
9     create_sorted("All.txt", "Under40.txt", "Over40.txt");
10    cout << "List of workers under 40:" << endl;
11    output_file("Under40.txt");
12    cout << "List of workers over 40:" << endl;
13    output_file("Over40.txt");
14 }
15
```

This screenshot shows the Visual Studio Code editor with the `functions.h` file open. The file contains the following code:

```
1 #include <iostream>
2 #include <string>
3 #include <fstream>
4 #include <cmath>
5 #include <iomanip>
6 #include <stdio>
7
8 using namespace std;
9
10 struct Date;
11 struct Worker;
12 string get_number();
13 void create_file(const string& name);
14 Worker input_data();
15 string get_gender();
16 void output_file(const string& name);
17 bool is_number(const string& word);
18 string get_day();
19 string get_month();
20 int get_year();
21 string get_name();
22 int get_amount();
23 void create_sorted(const string& old, const string& under, const string& over);
24
```

The interface includes a sidebar with a project tree, a top menu bar, and a bottom status bar showing the current file, line numbers, and system information.

This screenshot shows the Visual Studio Code editor with the `functions.cpp` file open. The file contains the following code:

```
1 #include "functions.h"
2
3 using namespace std;
4
5 struct Date{
6     char day[4];
7     char month[4];
8     int year;
9 };
10
11 struct Worker{
12     char name[21];
13     char number[9];
14     char gender[7];
15     Date birth;
16 };
17
18 void create_file(const string& name){
19     ofstream file;
20     string ch;
21     cout << "Would you like to rewrite information (Y/N)? ";
22     cin >> ch;
23     while (ch != "Y" and ch != "y" and ch != "N" and ch != "n") {
24         cout << "Wrong input. Enter 'Y' or 'N'. ";
25     }
26     create_file
27 }
```

The interface includes a sidebar with a project tree, a top menu bar, and a bottom status bar showing the current file, line numbers, and system information.

```
17
18 void create_file(const string& name){
19     ofstream file;
20     string ch;
21     cout << "Would you like to rewrite information (Y/N)? ";
22     cin >> ch;
23     while (ch != "Y" and ch != "y" and ch != "N" and ch != "n") {
24         cout << "Wrong input. Enter 'Y' or 'N'. ";
25         cin >> ch;
26     }
27     if (ch == "Y" or ch == "y") file.open(s name, mode ios::binary);
28     else file.open(s name, mode ios::binary | ios::app);
29     int num = get_amount();
30     for (int i = 0; i < num; ++i) {
31         Worker person = input_data();
32         while (person.birth.year > 2002 or person.birth.year < 1962){
33             cout << "Age of this person is out of range. Try again." << endl;
34             person = input_data();
35         }
36         file.write(s (char*)&person, n sizeof(Worker));
37         cout << "Recorded" << endl;
38     }
39     file.close();
40 }
41
42 void create_sorted(const string& old, const string& under, const string& over){
43     ifstream file(s old, mode ios::binary);
44     get_amount
```

```
41
42 void create_sorted(const string& old, const string& under, const string& over){
43     ifstream file(s old, mode ios::binary);
44     ofstream un(s under, mode ios::binary), ov(s over, mode ios::binary);
45     Worker person{};
46     while (file.read(s (char*)&person, n sizeof(Worker))){
47         if (person.birth.year <= 1982) ov.write(s (char*)&person, n sizeof(Worker));
48         else un.write(s (char*)&person, n sizeof(Worker));
49     }
50     file.close();
51     un.close();
52     ov.close();
53 }
54
55 int get_amount(){
56     string num;
57     cout << "Enter number of workers to add: ";
58     cin >> num;
59     cin.ignore();
60     while (!is_number(word: num) or stoi(str: num) < 1){
61         cout << "Enter a positive integer: ";
62         cin >> num;
63         cin.ignore();
64     }
65     return stoi(str: num);
66 }
67
input_data
```

This screenshot shows the Visual Studio Code editor with the `functions.cpp` file open. The code defines a `Worker` struct and a `get_name()` function. The `Worker` struct has fields for `name`, `number`, `gender`, `birth.day`, `birth.month`, and `birth.year`. The `get_name()` function prompts the user for a full name (up to 20 symbols) and loops until the input is valid. The `main.cpp` file is also visible in the project explorer, showing the `input_data()` function which uses `get_name()` and `get_gender()` to populate a `Worker` struct.

```
65 return stoi(str_num);
66
67
68 Worker input_data(){
69     Worker per{};
70     strcpy( Dest: per.name, Source: get_name().c_str());
71     strcpy( Dest: per.number, Source: get_number().c_str());
72     strcpy( Dest: per.gender, Source: get_gender().c_str());
73     strcpy( Dest: per.birth.day, Source: get_day().c_str());
74     strcpy( Dest: per.birth.month, Source: get_month().c_str());
75     per.birth.year = get_year();
76     return per;
77 }
78
79 string get_name(){
80     string name;
81     cout << "Full name (up to 20 symbols): ";
82     getline( &cin, &name);
83     while(name.length() > 20){
84         cout << "Too Long. Try again: ";
85         getline( &cin, &name);
86     }
87     return name;
88 }
89
90 string get_gender(){
91     cout << "Gender (M/F): ";
92     get_gender
```

This screenshot shows the Visual Studio Code editor with the `functions.cpp` file open, displaying the implementation of `get_gender()` and `get_day()` functions. The `get_gender()` function prompts the user for gender (M/F) and loops until a valid input is received. The `get_day()` function prompts the user for the day of birth and loops until a valid number (1 to 31) is entered. The `main.cpp` file is also visible in the project explorer, showing the `input_data()` function which uses `get_name()` and `get_gender()` to populate a `Worker` struct.

```
90 string get_gender(){
91     cout << "Gender (M/F): ";
92     string gen;
93     cin >> gen;
94     cin.ignore();
95     while (not(gen == "M" or gen == "m" or gen == "F" or gen == "f")) {
96         cout << "Wrong input. Enter letter M for male or F for female: ";
97         cin >> gen;
98         cin.ignore();
99     }
100     if (gen == "M" or gen == "m") return "male";
101     else if (gen == "F" or gen == "f") return "female";
102 }
103
104 string get_day(){
105     string d;
106     cout << "Day of birth: ";
107     cin >> d;
108     cin.ignore();
109     while (!is_number( word: d) or stoi( &cin, &d) < 1 or stoi( &cin, &d) > 31){
110         cout << "Wrong input. Enter a number from 1 to 31: ";
111         cin >> d;
112         cin.ignore();
113     }
114     if (stoi( &cin, &d) < 10) d = '0' + d;
115     return d+'.';
116 }
117
```

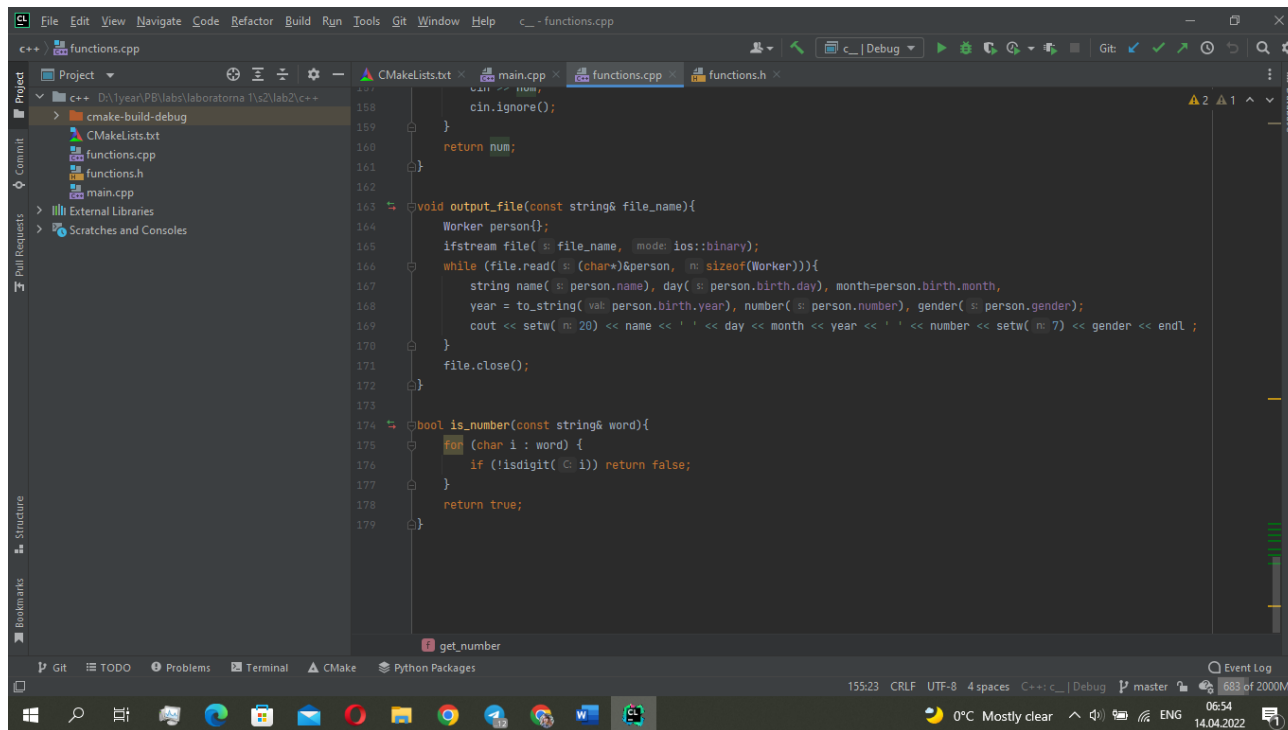
This screenshot shows the Visual Studio Code editor with the `functions.cpp` file open. The editor displays the implementation of two functions: `get_month()` and `get_year()`. The `get_month()` function prompts the user for a month number (1-12) and returns the month name as a string. The `get_year()` function prompts the user for a birth year (1900-2022) and returns it as an integer. The project structure on the left shows a CMakeLists.txt file and a main.cpp file. The status bar at the bottom indicates the file is in the `Debug` configuration.

```
118 string get_month(){
119     string m;
120     cout << "Month of birth (number): ";
121     cin >> m;
122     cin.ignore();
123     while (!is_number(word: m) or stoi(str: m) < 1 or stoi(str: m) > 12){
124         cout << "Wrong input. Enter a number from 1 to 31: ";
125         cin >> m;
126         cin.ignore();
127     }
128     if (stoi(str: m) < 10) m = '0' + m;
129     return m+'.';
130 }
131
132 int get_year(){
133     string y;
134     cout << "Enter year of birth: ";
135     cin >> y;
136     cin.ignore();
137     while (!is_number(word: y) or stoi(str: y) < 1900 or stoi(str: y) > 2022) {
138         cout << "Wrong input. Try again: ";
139         cin >> y;
140         cin.ignore();
141     }
142     return stoi(str: y);
143 }
144
```

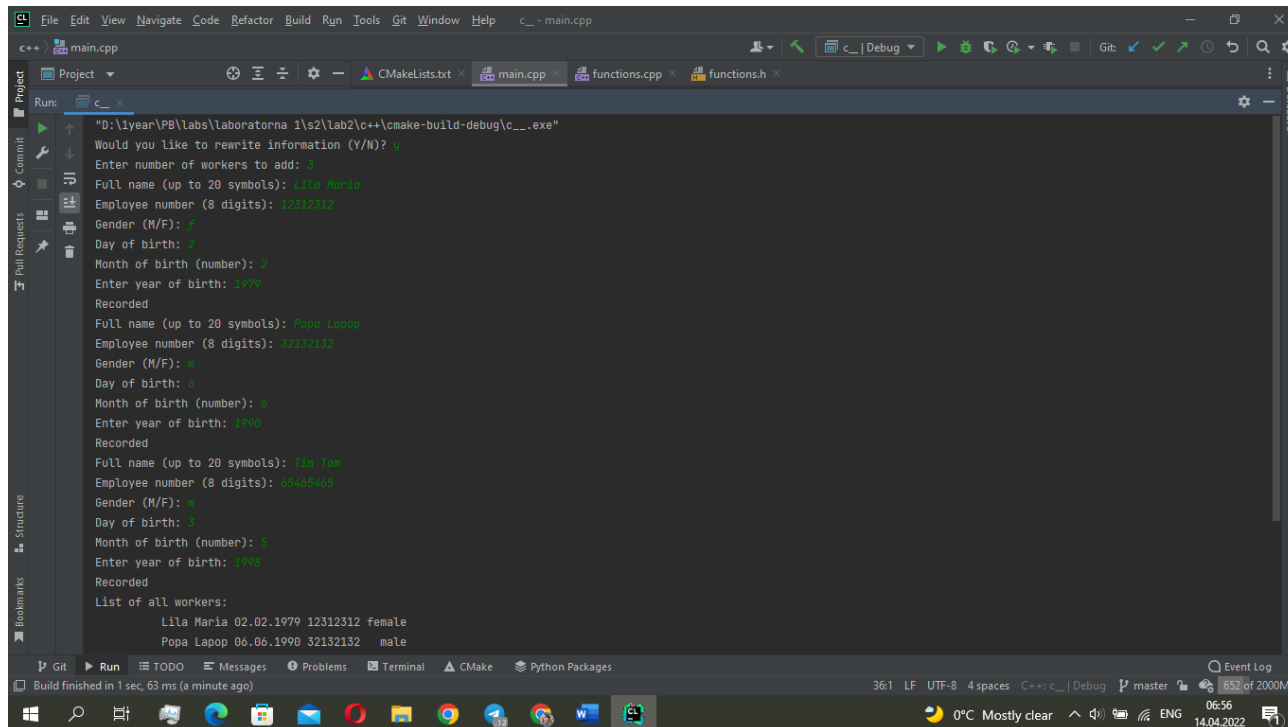
This screenshot shows the Visual Studio Code editor with the `functions.cpp` file open, displaying the implementation of `get_number()` and `output_file()` functions. The `get_number()` function prompts the user for an 8-digit employee number and returns it as a string. The `output_file()` function is a placeholder for writing to a file. The project structure on the left shows a CMakeLists.txt file and a main.cpp file. The status bar at the bottom indicates the file is in the `Debug` configuration.

```
141 }
142 return stoi(str: y);
143 }
144
145 string get_number(){
146     string num;
147     cout << "Employee number (8 digits): ";
148     cin >> num;
149     cin.ignore();
150     while (num.length() != 8){ //check if there are 8 chars
151         cout << "Wrong length. Enter 8 digits: ";
152         cin >> num;
153         cin.ignore();
154     }
155     while (!is_number(word: num)){ //check if all chars are digits
156         cout << "All chars have to be digits. Enter 8 digits: ";
157         cin >> num;
158         cin.ignore();
159     }
160     return num;
161 }
162
163 void output_file(const string& file_name){
164     Worker person{};
165 }

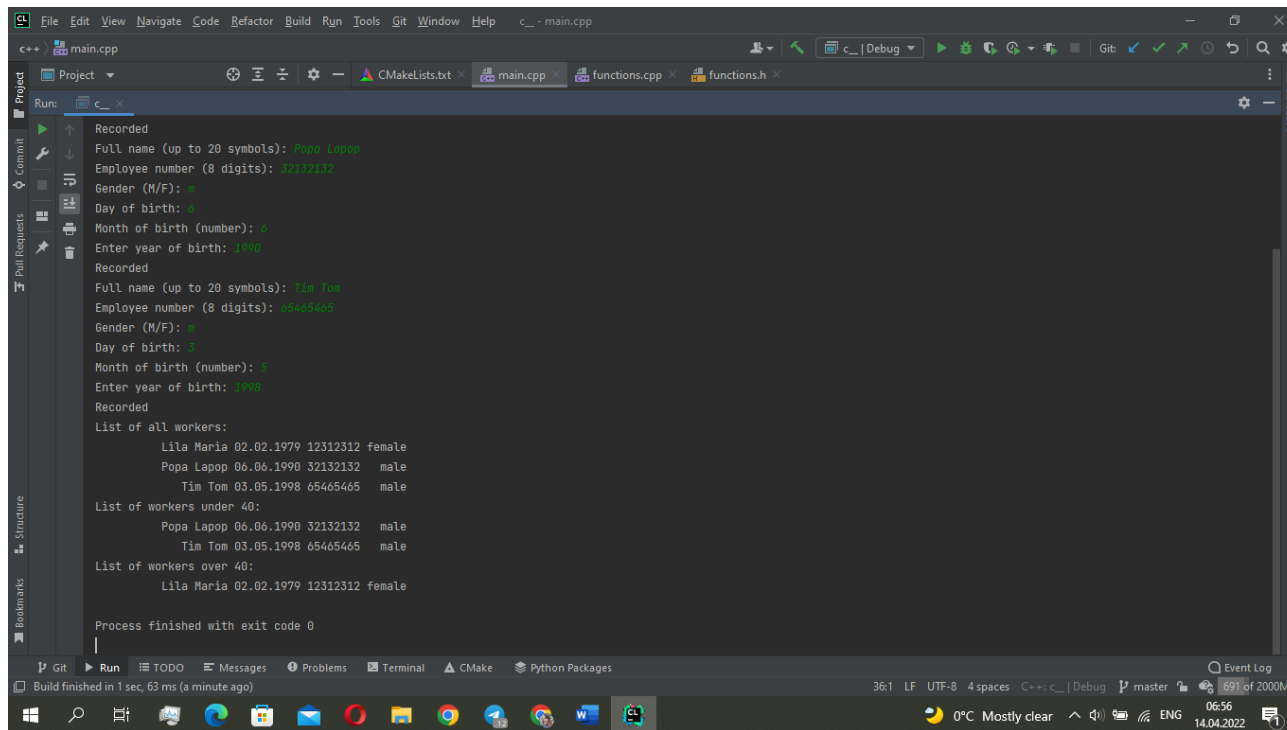
```



```
157     cin >> num;
158     cin.ignore();
159 }
160 return num;
161 }
162
163 void output_file(const string& file_name){
164     Worker person{};
165     ifstream file( file_name, mode::ios::binary);
166     while (file.read( (char*)&person, sizeof(Worker))){
167         string name( person.name), day( person.birth.day), month=person.birth.month,
168             year = to_string( person.birth.year), number( person.number), gender( person.gender);
169         cout << setw( 20) << name << ' ' << day << month << year << ' ' << number << setw( 7) << gender << endl ;
170     }
171     file.close();
172 }
173
174 bool is_number(const string& word){
175     for (char i : word) {
176         if (!isdigit( i)) return false;
177     }
178     return true;
179 }
```

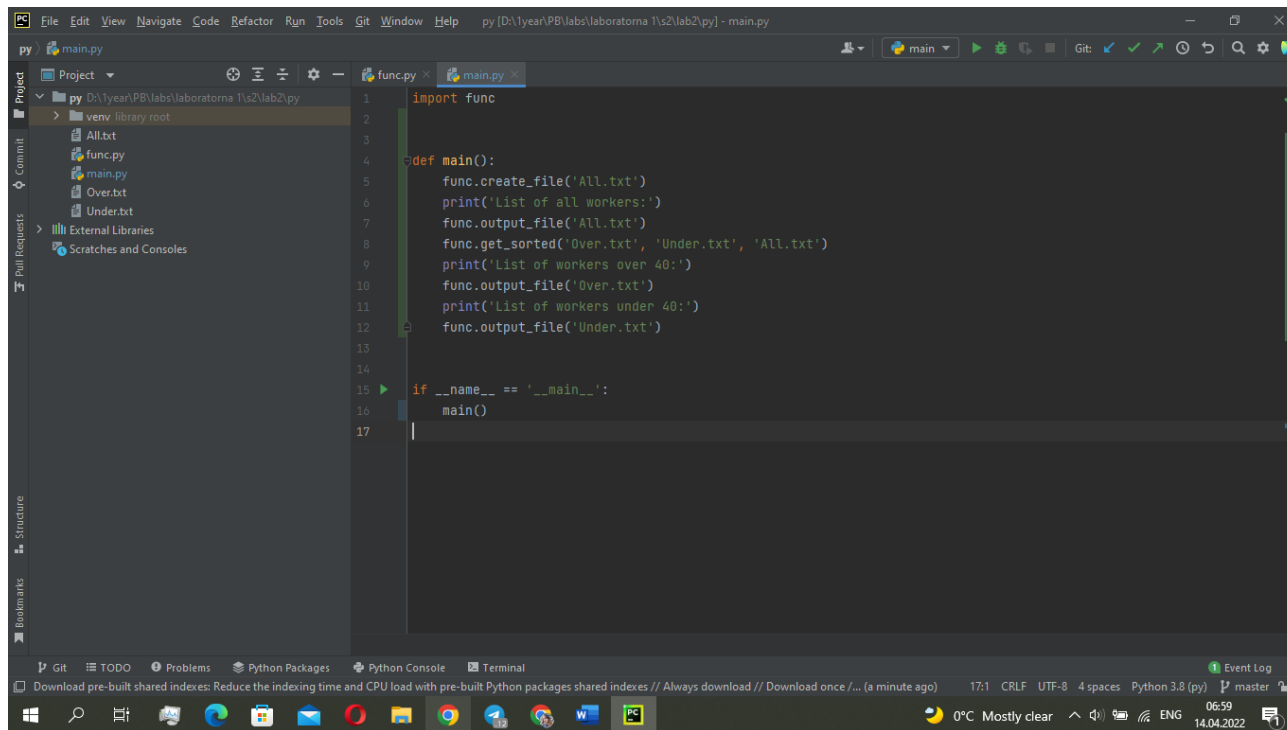


```
Run: "D:\1year\PB\labs\laboratona 1\s2\lab2\c++\cmake-build-debug\c_...exe"
Would you like to rewrite information (Y/N)? y
Enter number of workers to add: 3
Full name (up to 20 symbols): Lila Maria
Employee number (8 digits): 12312312
Gender (M/F): f
Day of birth: 2
Month of birth (number): 2
Enter year of birth: 1979
Recorded
Full name (up to 20 symbols): Popa Lapop
Employee number (8 digits): 32132132
Gender (M/F): m
Day of birth: 6
Month of birth (number): 6
Enter year of birth: 1990
Recorded
Full name (up to 20 symbols): Popa Lapop
Employee number (8 digits): 32132132
Gender (M/F): m
Day of birth: 6
Month of birth (number): 6
Enter year of birth: 1990
Recorded
List of all workers:
Lila Maria 02.02.1979 12312312 female
Popa Lapop 06.06.1990 32132132 male
```

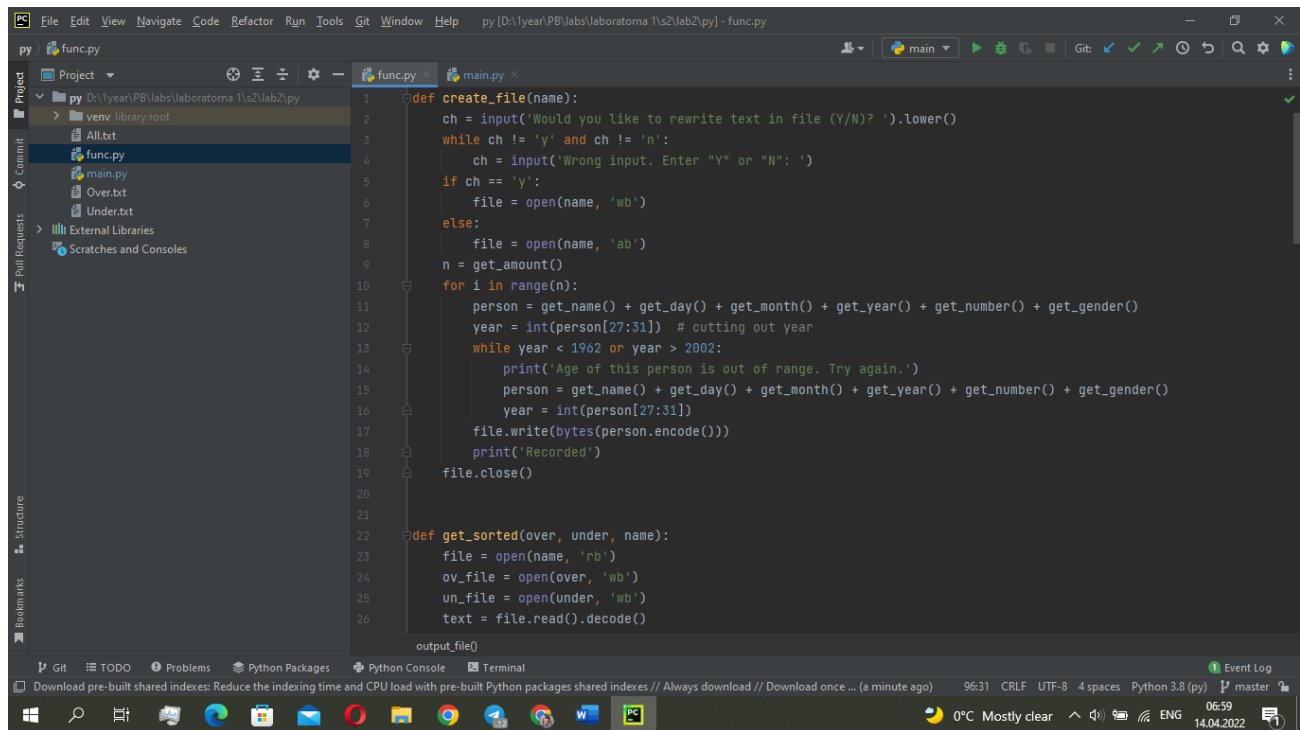


```
Recorded
Full name (up to 20 symbols): Popa Lapop
Employee number (8 digits): 32132132
Gender (M/F): f
Day of birth: 2
Month of birth (number): 2
Enter year of birth: 1979
Recorded
Full name (up to 20 symbols): Tim Tom
Employee number (8 digits): 65465465
Gender (M/F): m
Day of birth: 3
Month of birth (number): 5
Enter year of birth: 1998
Recorded
List of all workers:
    Lila Maria 02.02.1979 12312312 female
    Popa Lapop 06.06.1990 32132132 male
    Tim Tom 03.05.1998 65465465 male
List of workers under 40:
    Popa Lapop 06.06.1990 32132132 male
    Tim Tom 03.05.1998 65465465 male
List of workers over 40:
    Lila Maria 02.02.1979 12312312 female
Process finished with exit code 0
```

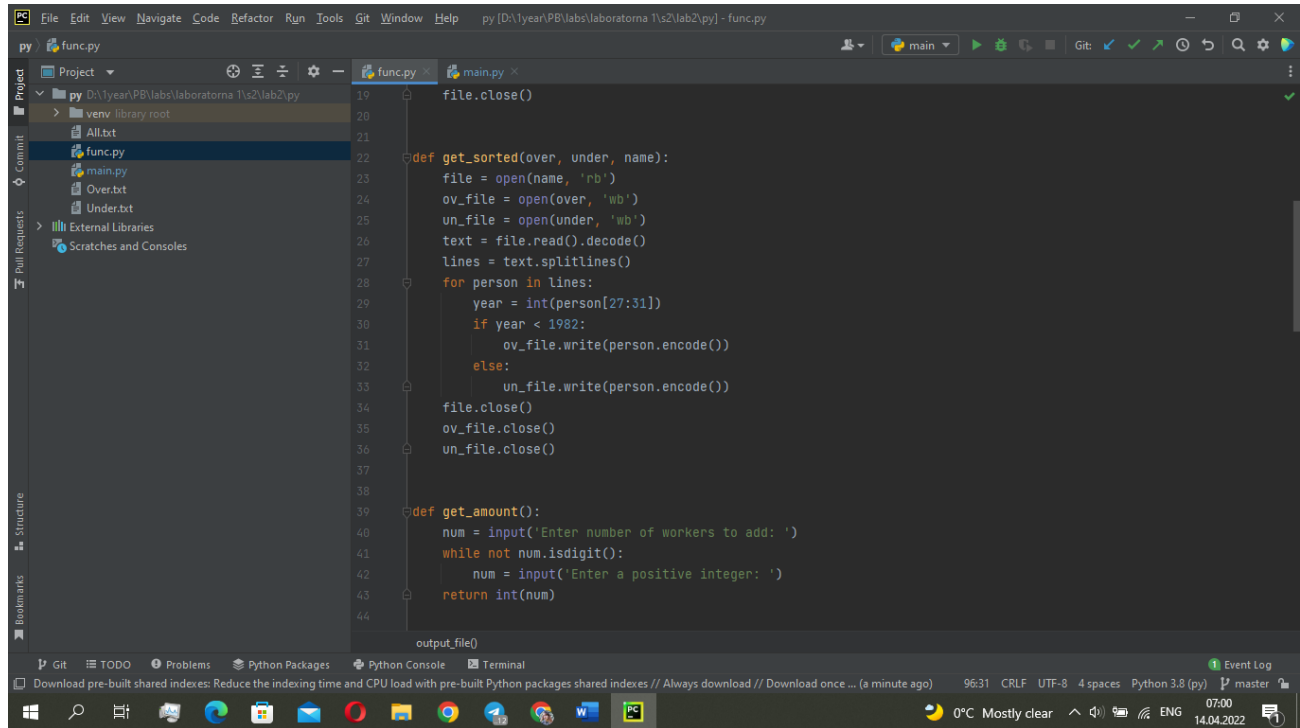
Виконання на Python



```
1 import func
2
3
4 def main():
5     func.create_file('All.txt')
6     print('List of all workers:')
7     func.output_file('All.txt')
8     func.get_sorted('Over.txt', 'Under.txt', 'All.txt')
9     print('List of workers over 40:')
10    func.output_file('Over.txt')
11    print('List of workers under 40:')
12    func.output_file('Under.txt')
13
14
15 if __name__ == '__main__':
16     main()
17
```

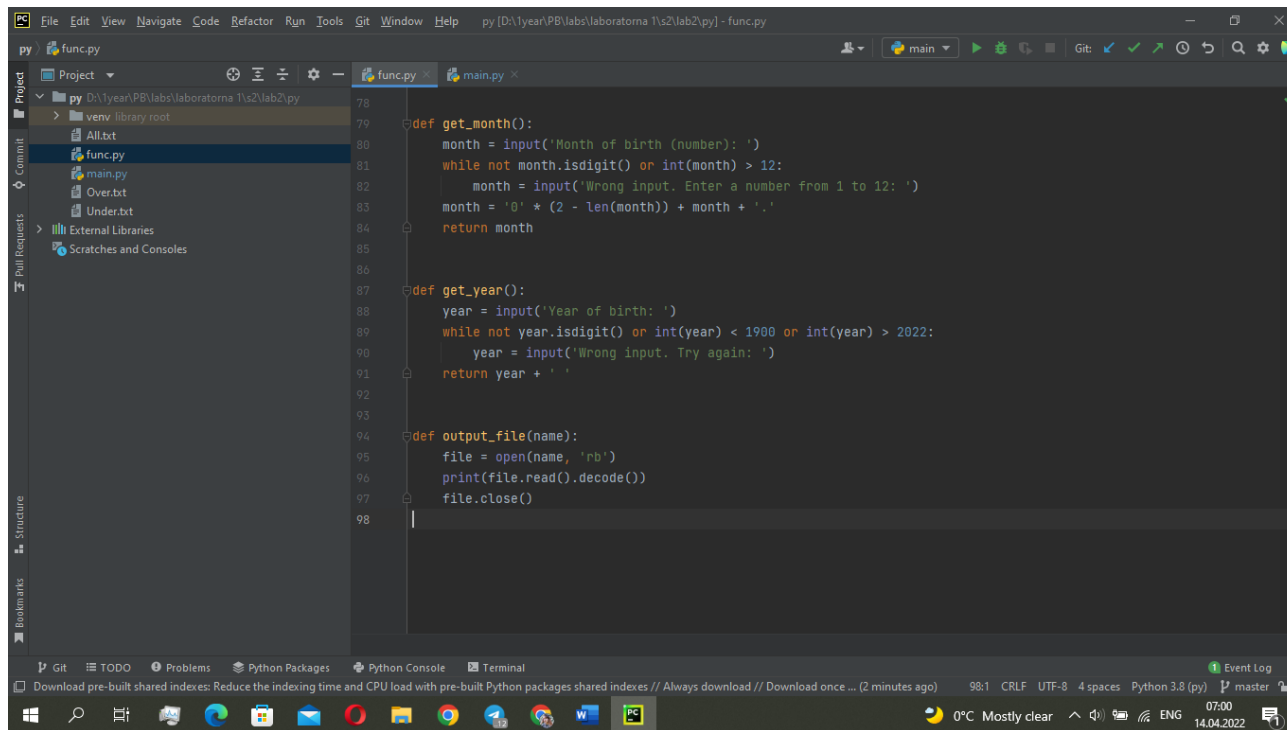
```
1 def create_file(name):
2     ch = input('Would you like to rewrite text in file (Y/N)? ').lower()
3     while ch != 'y' and ch != 'n':
4         ch = input('Wrong input. Enter "Y" or "N": ')
5     if ch == 'y':
6         file = open(name, 'wb')
7     else:
8         file = open(name, 'ab')
9     n = get_amount()
10    for i in range(n):
11        person = get_name() + get_day() + get_month() + get_year() + get_number() + get_gender()
12        year = int(person[27:31]) # cutting out year
13        while year < 1962 or year > 2002:
14            print('Age of this person is out of range. Try again.')
15            person = get_name() + get_day() + get_month() + get_year() + get_number() + get_gender()
16            year = int(person[27:31])
17        file.write(bytes(person.encode()))
18        print('Recorded')
19    file.close()
20
21
22 def get_sorted(over, under, name):
23     file = open(name, 'rb')
24     ov_file = open(over, 'wb')
25     un_file = open(under, 'wb')
26     text = file.read().decode()
27     lines = text.splitlines()
28     for person in lines:
29         year = int(person[27:31])
30         if year < 1982:
31             ov_file.write(person.encode())
32         else:
33             un_file.write(person.encode())
34     file.close()
35     ov_file.close()
36     un_file.close()
37
38
39 def get_amount():
40     num = input('Enter number of workers to add: ')
41     while not num.isdigit():
42         num = input('Enter a positive integer: ')
43     return int(num)
```



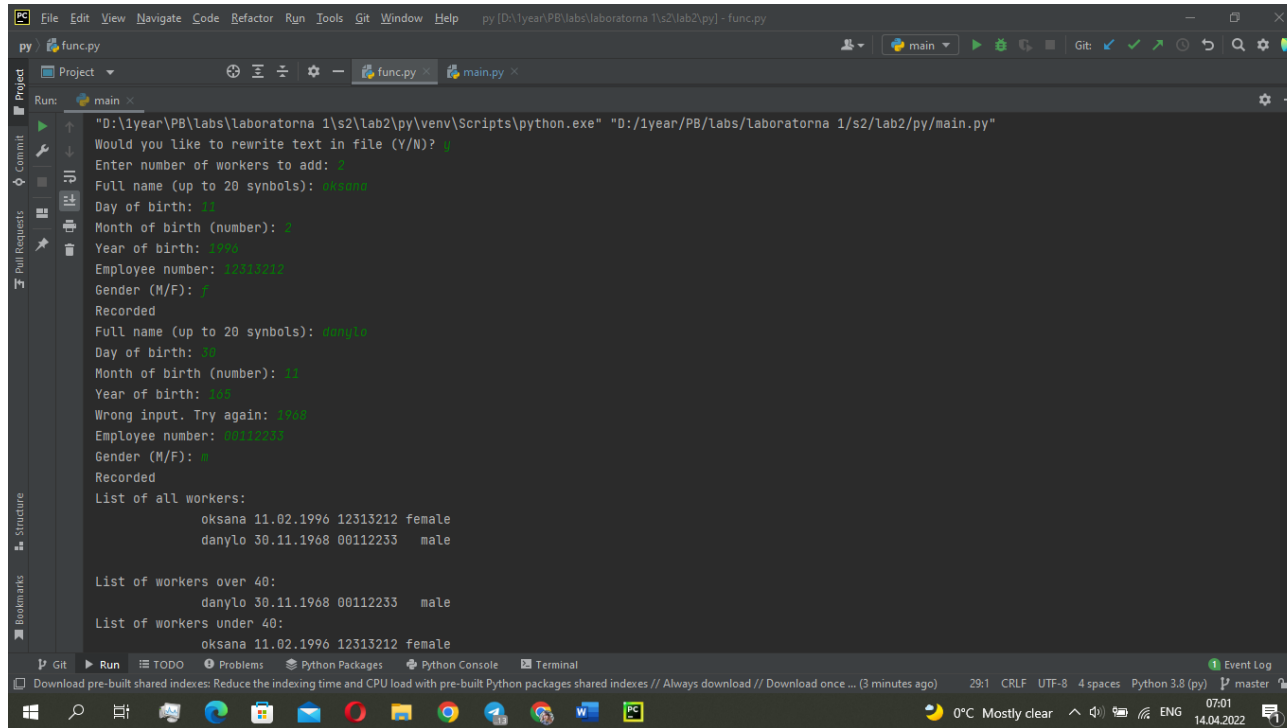
```
19 file.close()
20
21
22 def get_sorted(over, under, name):
23     file = open(name, 'rb')
24     ov_file = open(over, 'wb')
25     un_file = open(under, 'wb')
26     text = file.read().decode()
27     lines = text.splitlines()
28     for person in lines:
29         year = int(person[27:31])
30         if year < 1982:
31             ov_file.write(person.encode())
32         else:
33             un_file.write(person.encode())
34     file.close()
35     ov_file.close()
36     un_file.close()
37
38
39 def get_amount():
40     num = input('Enter number of workers to add: ')
41     while not num.isdigit():
42         num = input('Enter a positive integer: ')
43     return int(num)
```

```
py [D:\1year\PB\labs\laboratorna 1\2\lab2\py] - func.py
Project
  py
    D:\1year\PB\labs\laboratorna 1\2\lab2\py
      venv
        library root
      All.txt
      func.py
      main.py
      Over.txt
      Under.txt
    External Libraries
    Scratches and Consoles
  Pull Requests
  Structure
  Bookmarks

func.py
43 return int(num)
44
45
46 def get_name():
47     name = input('Full name (up to 20 symbols): ')
48     while len(name) > 20:
49         name = input('Too long. Try again: ')
50     name = ' ' * (20 - len(name)) + name + ' '
51     return name
52
53
54 def get_number():
55     number = input('Employee number: ')
56     while not number.isdigit() or len(number) != 8:
57         number = input('Wrong input. Enter 8 digits: ')
58     return number + ' '
59
60
61 def get_gender():
62     gen = input('Gender (M/F): ').lower()
63     while gen != 'm' and gen != 'f':
64         gen = input('Wrong input. Enter letter M for male or F for female: ')
65     if gen == 'm':
66         return ' male\n'
67     else:
68         return 'female\n'
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79 def get_month():
80     month = input('Month of birth (number): ')
81     while not month.isdigit() or int(month) > 12:
82         month = input('Wrong input. Enter a number from 1 to 12: ')
83     month = '0' * (2 - len(month)) + month + '.'
84     return month
85
86
87 def get_year():
88     year = input('Year of birth: ')
89     while not year.isdigit() or int(year) < 1900 or int(year) > 2022:
90         year = input('Wrong input. Try again: ')
91     return year + ' '
92
93
94 def output_file(name):
95     file = open(name, 'rb')
96     print(file.read().decode())
97     file.close()
98
```



```
Run: main
"D:\1year\PB\labs\laboratorna 1\s2\lab2\py\venv\Scripts\python.exe" "D:/1year/PB/labs/laboratorna 1/s2/lab2/py/main.py"
Would you like to rewrite text in file (Y/N)? y
Enter number of workers to add: 2
Full name (up to 20 symbols): oksana
Day of birth: 11
Month of birth (number): 2
Year of birth: 1996
Employee number: 12313212
Gender (M/F): f
Recorded
Full name (up to 20 symbols): danylo
Day of birth: 30
Month of birth (number): 11
Year of birth: 1968
Wrong input. Try again: 1968
Employee number: 00112233
Gender (M/F): m
Recorded
List of all workers:
    oksana 11.02.1996 12313212 female
    danylo 30.11.1968 00112233 male

List of workers over 40:
    danylo 30.11.1968 00112233 male

List of workers under 40:
    oksana 11.02.1996 12313212 female
```

Висновки

Протягом лабораторної роботи було розглянуто роботу з бінарними файлами та використано отримані навички під час написання програм. В результаті роботи було створену програму, яка створює новий файл, що містить інформацію про співробітників, перевіряє на коректність введені дані, записує дані у файл, якщо вік співробітника від 20 до 60 років, а також створює 2 нових файли – зв співробітниками старше та молодше 40 років.