GLASGOW COLLEGE UESTC

Exam paper

Introductory Programming (UESTC 1005)

Date: 4th Jan. 2021
Time: 14:00-16:00

Attempt all PARTS. Total 100 marks

Use one answer sheet for each of the questions in this exam.
Show all work on the answer sheet.

Make sure that your University of Glasgow and UESTC Student Identification Numbers are on all answer sheets.

An electronic calculator may be used provided that it does not allow text storage or display, or graphical display.

All graphs should be clearly labelled and sufficiently large so that all elements are easy to read.

The numbers in square brackets in the right-hand margin indicate the marks allotted to the part of the question against which the mark is shown. These marks are for guidance only.

Continued overleaf

Q1 (a) Identify the logical as well as the syntax errors in the following blocks of code and correct the errors based on the description provided.

(i) The code fragment below aims to accept three integer-value inputs from the user and print them on screen:

```
1    int x, y, z;
2    scanf("%f %f %f", x, y, z);
3    printf("%2.2f %3f %f", x, y, z);
```

[5]

(ii) The code fragment below prints the values of integer-type variables after arithmetic operations are used for value assignments:

```
1    int x, y; z;
2    x = 5;
3    y = 3;
4    y = ++x + y;
5    z = z-- + x;
6    printf("%d %d %d\n", x, y, z);
```

[5]

(b) Write down the sequence of values printed along with the formatting after the program in Fig. Q1(b) is run. [5]

```
#include <stdio.h>

int main() {
  int i, j = 5;
  for (i = 5; i >= 0; i -= 1)
  {
    printf("%i ", i);
    if (j % 3 == 0) {
      printf("\n");
    }
    if (j % 2 == 0) {
      printf("\t");
    }
    j++;
  }
  return 0;
}
```

Figure Q1(b)

Continued overleaf

(c) Write a program that accepts the date as a user input which follows the format, <day> <month> and prints the date on screen in the format <DD>/<MM> As an example, if the user inputs the date as 1 1, the output is 01/01. You can use if-else statements to display the days and months in two-digit format. The program should also display an error if a wrong date is inserted. Consider the range of <day>, <month>, and <year> as 1 - 31 , and 1 – 12 respectively. [10]

Q2 (a) Write a C program to display n even natural numbers from 10 and their sum. It should ask the user to input the number, n. An example is shown in Fig. Q2(a) (with user inputs in bold text). [10]

```
Example:
Input number of terms: 10
The even numbers are: 12 14 16 18 20 22 24 26 28 30
The sum is: 210
```

Figure Q2(a)

(b) Write the calculate_str_length function referred to in the code as shown in Fig. Q2(b), which calculates the length of a string.

```
#include <stdio.h>
int calculateLength(char*);

int main()
{
   char str1[100];
   int l;
   printf("Input a string here: ");
   fgets(str1, sizeof(str1), stdin);
   l = calculate_str_length(str1);
   printf("Length of string %s is : %d ", str1, l-1);

   return 0;
}
```

Figure Q2(b)

(i) Write the function definition. [5]
(ii) Write the main body of the function to achieve the task. The program should use pointers. [10]

Continued overleaf

Q3 Write a C program to merge two integer 1D arrays (each of them no longer than 100 elements) and sort the output in descending order. The arrays to be merged and sorted are defined and data entered into them at the main program level, which should first ask the user for the number of elements to be considered and then for the elements of each array.
Merging and sorting of the arrays should be carried out by a separate function, called by the main program.
An example of program operation is given in Fig. Q3 (with user inputs in bold text).

```
Input the number of elements in the first array: 3
Input the 3 elements in the array:
element[0]: 1
element[1]: 2
element[2]: 3
Input the number of elements in the second array: 2
Input 2 elements in the array:
Element[0]: 4
Element[1]: 5
The merged array in descending order is:
5   4   3   2   1
```

Figure Q3

(a) Write the code of the main program that inputs the two arrays and store the arrays [10]

(b) Complete the function of merging the arrays and array sorting
- (i) Merge the arrays [5]
- (ii) Array sorting [5]
- (iii) Function definition and prototype [5]

Q4 (a) You have been asked to develop a programme that takes a line of text (not more than 100 characters) as an input from a user. You should do the following:

(i) Write a snippet of code that takes a line of text as a string variable and parse (breaks) the string into series of tokens using the string tokenization function in the string library. [5]

(ii) Write a snippet of code that prints the tokens already parsed but prints them in the reverse order. [5]

Q4 (b) You have been provided with a list of flights that will operate between four different airports as shown in Table Q4-b. Each airport has a specific text code:

Continued overleaf

AP1, AP2, AP3 and AP4. Write a program that lists all the flights that leave from the two airports specified by the user.

(i) Write a code snippet that declare a structure `reservation_struct` which contains flight number, departure airport code, arrival airport code, departure time, and arrival time. [4]

(ii) Show how the structure could be initialized with the data provided in Table Q4-b. [2]

(iii) Write a program should prompt the user to input any of the two airport codes and it should output the flights departing from the specified airports. (you need not repeat the code written in parts (i) and (ii)) [9]

Flight number	Departure Airport Code	Arrival Airport Code	Departure Time	Arrival Time
3269	AP1	AP2	20110120090436	20110120095536
4189	AP2	AP3	20110120100436	20110120105536
603	AP3	AP4	20110120090436	20110120095536
900	AP2	AP1	20110120105536	20110120115536
1337	AP4	AP2	20110120090436	20110120095536
9027	AP3	AP1	20110120100436	20110120110436

Table Q4-b

End of question paper