

**COMP 1601: Computer Programming 1**  
**Course Work Exam #2**  
**Duration: 1 hour 30 minutes**

**Instructions:**

1. Answer **ALL** questions.
2. All answers must be written on the answer booklet provided.

1. a) Convert the following code fragment which uses a “for” loop into an equivalent code fragment which uses a “while” loop.

```
int a;  
int s = 1;  
for (a = 10; a > 0; a = a-1)  
    s = s + a;  
cout << s << endl;
```

10  
9  
8  
7  
6  
5  
4  
3  
2  
1

[4]

- b) Consider the program given below:

```
#include <iostream>  
#include <cmath>  
using namespace std;  
  
int main() {  
    int a, b, p, q, r;  
  
    cout << "Enter two positive integer values: ";  
    cin >> a >> b;  
    p = a ;  
    q = b ;  
  
    while (q != 0) {  
        r = p % q;  
        p = q;  
        q = r;  
    }  
  
    cout << "The answer is: " << p << endl;  
    return 0;  
}
```

Use a trace table with headings *a*, *b*, *p*, *q*, and *r* to show your working for parts (i) and (iii).

- i) What is the output of the program if -2 and 17 are entered for *a* and *b* respectively? [5]
- ii) What is the output of the program if 5 and 0 are entered for *a* and *b* respectively? [1]
- iii) What is the output of the program if  $r = p \% q$ ; is replaced by  $r = p / q$ ; in the first line of the **while** loop? Use the values for *a* and *b* given in i). [3]

**Total marks: 13**

2. a) Write a fragment of code that uses a `while` loop to generate and display all the multiples of 11 between 0 and 5000 inclusive. Two values are displayed on each line as follows:

```
11    22
33    44
...
4983  4994
```

[4]

- b) A *prime* number is a number that is divisible *only* by itself and 1. For example 7 and 31 are prime numbers but 4 and 20 are not prime numbers.  
A prime number,  $n$ , can be found by checking if there is no remainder when  $n$  is divided by all the numbers from 2 to  $n/2$ .

Write a segment of code which prompts the user for a number  $n$  and print whether  $n$  is a prime number or not. [6]

**Total marks: 10**

3. At the beginning of 1952, the seal population numbered  $P$  seals. Each year, the seal population is affected by the following:
- The population increases by  $B\%$  due to new seals being born.
  - The population decreases by  $S\%$  due to seals dying because of overhunting or overfishing of their food sources.
  - The population decreases by  $D\%$  due to seals dying because of oil spills and disease.

Write a program that accepts as input  $P$ ,  $B$ ,  $S$  and  $D$  and starting from the year 1952, prints a table with the year, the amount of seals that are born, the amount of seals that die, and the population at the end of the year. Your program should stop when the population of seals drops to zero or when the number of seals that die is less than the number of seals born or when the year is 2020. [9]

**Total marks: 9**

4. A file, *marks.txt*, contains a set of marks obtained by students in an examination. The amount of marks is not known beforehand but a mark of -999 indicates that there are no more marks. There are no invalid marks in the file.

Write a program to read the marks from *marks.txt* and generate a summary of the results which is stored in the file, *results.txt*. The summary is as follows:

- The number of students who took the examination and the average mark.
- The number of students who passed (i.e., obtained a mark between 50 and 100).
- The number of students who failed (i.e., obtained a mark between 0 and 49).
- The number of students who got A's (i.e., obtained a mark between 75 and 100).
- The highest mark and the lowest mark. [13]

**Total marks: 13**

***End of Test (Total Marks is 45)***