
SEMESTER 1 EXAMINATIONS 2017-18

Advanced Computational Methods 1

DURATION 120 MINS

This paper contains 8 Questions. Answer All Questions.

This is a Computer-Based Exam.

All answers must be saved in the default folder “My Documents”.

For all questions, template files have been provided for your use. These files can be found in My Documents.

A total of 100 marks are available for this paper. Marks available for answering parts of the questions are shown in brackets thus [].

A foreign language direct ‘Word to Word’ translation dictionary (paper version ONLY) is permitted, provided it contains no notes, additions or annotations.

1.

- a). Write four key commands that can be used on/at a Linux terminal/command prompt and their equivalent commands on/at a Windows terminal/command prompt.
- b). Give three reasons for writing shell scripts.
- c). Give three reasons for writing make files.

Answer this question using the notepad editor to open the file q1.txt. You must save the file upon completion.

[10 marks]

2.

- a). What is a `function` in C-programming?
- b). C-programming offer two types of `functions`. What are they, and how are they different?
- c). Show two methods for defining a symbolic constant named `MAXIMUM` that has a value of 200.
- d). If a `function` does not return a value, what type should be used to declare it?
- e). In a one-dimensional array declared with `n` elements, what is the subscript of the last element?

Answer this question using the notepad editor to open the file q2.txt. You must save the file upon completion.

[10 marks]

3. Fill in the blanks in each of the following.

- a). The escape sequence `\n` represents the _____ character which causes the cursor to position to the beginning of the next line on the screen.
- b). Whenever a new value is placed in a memory location, that value overrides the previous value in that location. This process is known as _____ read-in.
- c). Counter-controlled repetition is also known as _____ repetition because it is known in advance how many times the loop will be executed.
- d). The elements of an array are related by the fact that they have the same _____ and _____.
- e). The number used to refer to a particular element of an array is called its _____.
- f). A pointer is a variable that contains as its value the _____ of another variable.
- g). The three values that can be used to initialise a pointer are _____, _____ or an _____.

Answer this question using the notepad editor to open the file q3.txt. You must save the file upon completion.

[10 marks]

TURN OVER

4. Find the error on each of the following code segments and explain how to correct it.

a).

```
#include<stdio.h>
int x=1:
int main ()
{
    if(x=1);
    printf("x equals 1");
    otherwise
    printf(" x does not equal 1");
    return 0;
}
```

b).

```
int x, y;
int array[10][3];
int main()
{
    for ( x=0; x<3; x++)
        for (y=0; y < 10; y++)
            array[x][y]=0;
    return 0;
}
```

c).

```
char *string1, string2;
string1 = "Hello World";
strcpy( string2, string1);
printf("%s %s", string1, string2);
```

Answer this question using the notepad editor to open the file q4 . txt. You must save the file upon completion.

[10 marks]

5. Open and extend the file `q5.c` by adding a function 'maximum' to find the maximum of four numbers 10.5, 20.2, 19.9, 5.9. Write the result to the standard output formatting it to one decimal place. You may extend the provided `main ()` function to complete the solution:

```
#include<stdio.h>
int main(void)
{
return 0;
}
```

Answer this question using the Quincy editor to open and extend the file `q5.c`. You must save the file upon completion.

[10 marks]

6. Open and extend the file `q6.c` to print an arbitrary number of integers using a `while` loop and the counter variable `x`. The number of integers to print per line should be specified. You may extend the provided `main ()` function to complete the solution:

```
#include<stdio.h>

int main() {

return 0;

}
```

Answer this question using the Quincy editor to open and extend the file `q6.c`. You must save the file upon completion.

[10 marks]

TURN OVER

7. In the code provided in `q7.c` and repeated below, the structure for `designData` needs to hold the data in the input file `designData.txt`. The three data values represent strut lengths in *mm* for each of three designs. Thus, the *main* routine needs to first call the function *read_from_file* to read data from the `designData.txt` file and then use the function *write_to_file* to create three output files named `design1.txt`, `design2.txt` and `design3.txt`. These files need to contain two lines with the following format for `design1.txt` - and similarly for the other two files -

Input script for design 1

Length of strut is 1.2 mm

The supplied code is as follows:

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

struct designData
{
    int numDesigns;
    float data[4];
};

int write_to_file()    /* Need parameter definitions
*/
{
    FILE *file; /* pointer to output file */

    /* Enter code here */

    return 0;
}

struct designData read_from_file(void)
{
    FILE *file;    /* pointer to input file */

    /* Enter code here */
```

```
    return desData;
}

int main(void)
{
    int i, numPts;

    /* Define other variables etc here */

    /*** Read data from file */

    /* Enter code here */

    /*** Loop through each design and write to file */
    for(i=0; i<numPts; i++)
    {

        /* Enter code here */

    }
    return 0;
}
```

Answer this question using the Quincy editor to open and extend the file `q7.c`. You must save the file upon completion.

[20 marks]

TURN OVER

8. In the code provided in `q8.c` and repeated below, use the random number generator `rand` to randomly store the elements of the values array in the array of pointers `valPtr`. Then use the `valPtr` data to print to screen the re-arranged data, in order as they occur in `valPtr`, followed by the sum and product of the four values. **The original values array must not be used** to perform these operations.

The random number generator, `rand`, should be used in conjunction with the function `srand` so as to vary the seed used in `rand`, as follows:

```
rand( (unsigned) time(NULL) );  
rand() % NUM;
```

The supplied code is as follows:

```
#include<stdio.h>  
#include<stdlib.h>  
#include<time.h>  
  
#define NUM 4  
  
int main(void) {  
    float values[] = {10.7, 13.4, 15.8, 19.2};  
    float *valPtr[NUM];  
  
    /* Enter code here */  
  
    return 0;  
}
```

Answer this question using the Quincy editor to open and extend the file `q8.c`. You must save the file upon completion.

[20 marks]

END OF PAPER