

Electrical Engineering and Information Technology, B.Eng  
Introduction to the C Programming Language: Exercises

## Exercise Sheet 4

1. Exercise. a) Understand and test the following program.

b) Change the program to use an *enumeration type* instead of the defines for IN and OUT. Define a type *statevalues* with enum and a suitable value list. Then define a variable *state* of type *statevalues* and change the necessary lines in the program.

```
#include <stdio.h>

#define IN      1      /* state inside a word. */
#define OUT     0      /* state outside a word.*/

int main(void)
/*****
/*
/* count lines, words and characters until '$' */
/*
*****/
{
char    c;
int     number_of_lines, number_of_words, number_of_chars;
int     state;

    /* Initialization */
    state = OUT;
    number_of_lines = 1; /* at least 1 line with '$' */
    number_of_words = 0;
    number_of_chars = 0;

    /* Implementation */
    c = getchar();
    while ( c != '$' ) {
        number_of_chars++;
        if (c == '\n') {
            number_of_lines++;
        }
        if ((c == ' ') || (c == '\n') || (c == '\t')) {
            state = OUT;
        }
        else if (state == OUT) {
            state = IN;
            number_of_words++;
        }
        c = getchar();
    }

    /* Output */
    printf("Lines = %d, Words = %d, Characters = %d\n",
        number_of_lines, number_of_words, number_of_chars);

    return(0); /* main() is int. */
} /* END_main() */
```

2. Exercise. Write a program, which recognizes words in a character input stream. Words are separated by blank, tab or new line. The end of the input stream is a '\$' character. Each word shall be printed to the screen, beginning on a new line. After the word, the number of characters of the word shall be printed on the same line.

Example:

Input>One to twenty\$

Output>One 3  
to 2  
twenty 6

3. Exercise. There is no format description for binary output in `printf()`. Please write a function

```
void binary_print(unsigned char c);
```

which prints `c` as a binary number to the monitor. Example 2-11 of the script might give you a hint how to do it.