

## COMPUTER SCIENCE TRIPOS Part IB – 2018 – Paper 4

### 1 Programming in C (NK)

- (a) The following function is specified to return the quotient of two integers, returning zero when the answer is undefined.

```
#include <stdint.h>
#include <limits.h>

int64_t divide(int64_t x, int64_t y) {
    return x / y;
}
```

- (i) Identify two bugs in this program.
- (ii) Write a correct version of this program.

[6 marks]

- (b) The `strlen` function takes a valid C string as an argument, and returns the length of the string up to and not including the first null character. An (erroneous) implementation is given below:

```
#include <stddef.h>

size_t strlen(const char *s) {
    size_t i;
    while (s[i] >= 0)
        i++;
    return i;
}
```

- (i) Find two errors in this program.
- (ii) Give a correct implementation of this function.

[6 marks]

- (c) Write a function with the prototype

```
void rotate(int len, int *array, int k)
```

which rotates its input `k` elements to the right. E.g., if the input `array` is the array `[0, 1, 2, 3, 4, 5]`, then the call `rotate(6, array, 2)` should result in `array` being modified to `[4, 5, 0, 1, 2, 3]`. Assume the array length is passed in the `len` argument and  $0 \leq k < \text{len}$ .

[8 marks]