

CLASSICAL AND QUANTUM COMPUTING EXERCISE I

Intel hex record files are printable files consisting of any number of Intel hex records. Each record is represented by exactly one line of the format

`:CCAAAARRDD...DZZ`

The leading colon indicates that the line is an Intel hex record. The characters following the colon are hexadecimal (base 16) digits, i.e. 0 to 9 and A to F. The first two digits represented by **CC** determine the number of data bytes (represented by two hexadecimal digits each). The next four digits, **AAAA**, is an address. The two digits **RR** indicate the record type:

- 00 for a data record
- 01 for an end of file record
- 02 for an extended segment address record
- 03 for a start segment address record
- 04 for an extended linear address record
- 05 for a start linear address record.

This is followed by the data bytes. Lastly two hexadecimal digits **ZZ** give the checksum, which is the two's complement of the sum of all the previous bytes (modulo 256).

For example, the record

`:020000021000EC`

has 2 data bytes, and is a data record, with address 0. The checksum is

$$EC=14*16+12=236$$

The sum of the preceding bytes is

$$2 + 0 + 0 + 2 + 16 + 0 = 20$$

in decimal. In binary 20 is represented as

00010100

The 8 bit one's complement of this bitstring is

11101011

Thus the 8 bit two's complement is

11101100

This gives the result

$$2^7 + 2^6 + 2^5 + 2^3 + 2^2 = 128 + 64 + 32 + 8 + 4 = 236.$$

Write a program to read an Intel hex record file which uses the checksum of each record to determine if the record is correct. Use the program with the following file.

```
:100000008316FF30850000308600831202300920FD  
:0C001000860082074134423443344434FB  
:00000001FF
```