1. Consider the following Turing Machine.

State	Input	Write	Move	Next
	B	B		Accept
0	0	0	L	0
	1	1	L	1
	B	B		Fail
1	0	0	L	1
	1	1	L	0

Determine what happens when the Turing Machine is run with the following inputs initially on the tape.

   (a) 0001
   (b) 0111
   (c) 0110
   (d) 0101010001
   (e) 0000000000000111
   (f) 00
   (g)

2. Give the state table for a Turing Machine that appends a parity bit to a tape with a string of consecutive 0's and 1's.

3. Construct a Turing Machine to compute the sequence 0_1_0_1_0_1 . . ., that is, 0 blank 1 blank 0 blank, etc [1].

4. Give the state table for a Turing Machine that multiplies a string of consecutive 0's and 1's by 2. The machine should treat the initial contents of the tape as a natural number written in binary form.

5. Give the state table for a Turing Machine that adds 1 to a string of consecutive 0's and 1's.

6. Give the state table for a Turing Machine that subtracts 1 to a string of consecutive 0's and 1's.

7. List all words of length at most three in Σ^* where Σ is:

   (a) $\{0, 1\}$
   (b) $\{a, b, c\}$
   (c) $\{\}$

8. Design Turing Machines to recognise the following languages:
   (a) $\{0^n 1^n | n \geq 1\}$
   (b) $\{ww | w \in \{0,1\}^*\}$

References

[1] A. M. Turing. On computable numbers, with an application to the entscheidungsproblem. *Proceedings of the London Mathematical Society*, s2-42(1):230–265, 1937.