Exploring Computer Technology

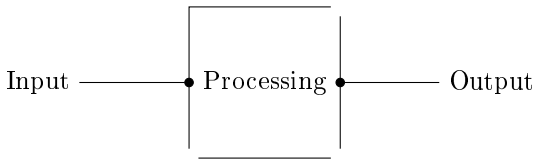
Practice Test (Tue. 17 October 2017)
Name:

1 Questions (30%)

Answer the questions below either by filling the blank or selecting the right option:

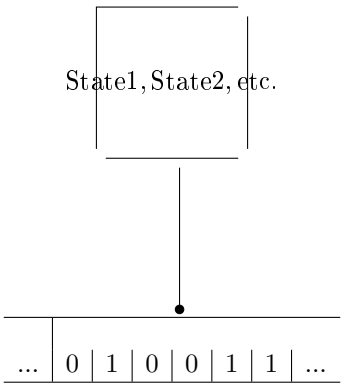
- 1. Since very early times, humans have searched for devices that would help them *bookeeping* calculations that where for them too involved to do mentally.
  - a) What was the first device in history used in calculating additions and substractions? A `B A C` u `S` (6 letters)
  - b) Approximately, when and where was it invented? how many years ago? Choose the right answer:
    - 1. ~~4 years ago in Irak~~
    - 2. ~~40 years ago in China~~
    - 3. ~~400 years ago in the US~~
    - 4. 4000 years ago in Mesopotamia, more or less what now is Irak √
- 2. The first computers build in the 40's and 50's used electromechanical parts (cables, switches, bulbs, resistors, vacuum tubes,...) and punch cards but no display nor keyboard. The size of those computers filled a big room. What is the key invention from 1950 (almost; actually 1947) that allowed to shrink the size of such a computer to that of a suitcase first and later lead to the laptops and smartphones of today? `T` r a n `S I S T` o r (10 letters)
- 3. The transistor is basically a switch: if it's switched on it lets current through, if switched off it doesn't allow current through. In this way the transitor allows for representing 0's and `1's`.
- 4. We all are used to interact with the computer using a graphical user interface (GUI): we move a mouse and we see on the screen a pointer moving, we click on the mouse and, say we start a browser, etc. Can you name the brand and/or the model of one of the first personal computers that had a graphical user interface? Brand: `A P P L E` Model: 1) `L I S A` or 2) `M A C I N T O S H`

- 5. Around 1945 a reknown mathematician, John von Neumann, described what it is now known as the *von Neumann architecture*, which summarizes the essence of what constitutes a computer. Sketch what we would say is the gist of the von Neumann architecture:



- 6. The T U R i N G M A C H I N e (6 & 7 letters, respectively) plays the role of the _processing_ unit in the von Neumann architecture.

- 7. Sketch the basic idea of what a Turing Machine is.6.

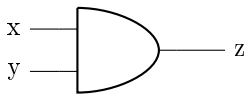


- 8. List at least two **different** *input devices* for a computer: **Keyboard, mouse, touchscreen, microphone, etc.**

2 Problems (70%)

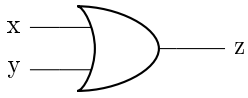
Remember to label each input and output lines and to use these labels correctly on the truth tables.

- 1. Draw the diagram of an AND gate and write down its truth table



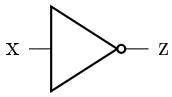
x	y	z
0	0	0
0	1	0
1	0	0
1	1	1

- 2. Draw the diagram of an OR gate and write down its truth table



x	y	z
0	0	0
0	1	1
1	0	1
1	1	1

- 3. Draw the diagram of a NOT gate and write down its truth table



x	z
0	1
1	0

- 4. See figure 1. What will be the value of z (the output in this logic circuit)? **Sol.: 1**

- 5. See figure 2. What will be the value of z (the output in this logic circuit)? **Sol.: 1**

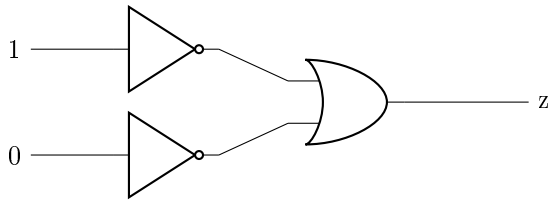


Figure 1: Logic circuit 1

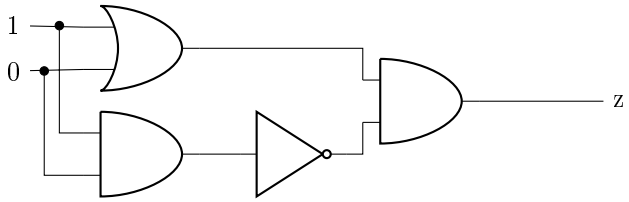


Figure 2: Logic circuit 2

- 6. What follows are the transition rules of a Turing Machine. Write down the computations steps when this machines starts at state and input given by the first line below:

$$
\begin{array}{lcl}
(A,1) & \longrightarrow & (1,C,\rightarrow) \\
(C,0) & \longrightarrow & (1,A,\rightarrow) \\
(C,1) & \longrightarrow & (0,A,\leftarrow)
\end{array}
$$

A	$1.0\,1\,0\,1\,1\,E$
C	$10.\,1\,0\,1\,1\,E$
A	$1\,1\,1.\,0\,1\,1\,E$
C	$1\,1\,1\,0.\,1\,1\,E$
A	$1\,1\,1\,1\,1.\,1\,E$
C	$1\,1\,1\,1\,1\,1.\,E$
A	$1\,1\,1\,1\,1.\,0\,E$
C	$1\,1\,1\,1\,1\,0.\,E$
A	$1\,1\,1\,1\,1\,1\,E.$
	HALT