FTC Assignment 1, 9 points

2.9 (1 point) Compute the downtime per year for $A(\infty) = 80\%, 75\%$ and 50%.

$A(\infty) = 80\%$, downtime is 73 days.
$A(\infty) = 75\%$, downtime is 91.25 days.
$A(\infty) = 50\%$, downtime is 182.5 days.

2.10 (1 point) A telephone system has less than 3 min per year downtime. What is its steady-state availability?

$$A(\infty) = 1 - \frac{3}{365 \cdot 24 \cdot 60} = 0.999994$$

2.18 (1 point) Give an example of a combinational logic circuit in which a single stuck-at fault on a given line never causes an error on the output.

Consider a circuit consisting of a single two-input OR gate, which has one primary input x, feeding both inputs of the OR. This circuit implements the function $x + x$. The stuck-at-0 fault of either one of the fan-out branches of x will never cause an error on the output, because $x + 0 = x + x = x$.

2.19 (2 points) Consider the logic circuit shown on p. 141, Fig. 6.4 of the textbook (full adder). Ignore the s-a-1 fault shown on the picture, i.e. the circuit you analyze does not have this fault.

(a) Find a test for stuck-at-1 fault on the input b.

Any test of type $(a, b, c) = (-, 0, -)$, where $''-''$ stands for "either 0, or 1", detects s-a-1 fault at b through the output s.

(b) Find a test for stuck-at-0 fault on the fan-out branch of the input a which feeds into an AND gate (lower input of the AND gate whose output is marked "s-a-1" on the picture).

The test $(a, b, c) = (1, 1, -)$, detects this fault.