The circuit for each would look like this:



The blue gate at the top is an OR gate, all the orange gates are AND gates. The in-degree of each AND gate is , as we can see by the group of purple nodes (inputs to the circuit), and there are orange AND gates, and the top blue node tells us whether the input belongs to – it is the output. The purple nodes is the -length input.

This circuit is correct because if the input , then it equals one of the accepted inputs, i.e. it’s the first one OR the second one OR … OR the th one, and for to equal , it has to be that .

This circuit is polynomial size because the number of edges is . QED.