

# Sequential Circuit Analysis

Tom Kelliher, CS 240

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## 1 Administrivia

### Announcements

Exam on 4/13, covering 4.1–5.4, including material covered in class on addition.

### Assignment

Read 5-5.

### From Last Time

Flip-Flops and waveforms.

### Outline

1. Reverse engineering a sequential circuit.
2. Input equations, state tables, and state diagrams.
3. Example problems.

## Coming Up

Sequential circuit design.

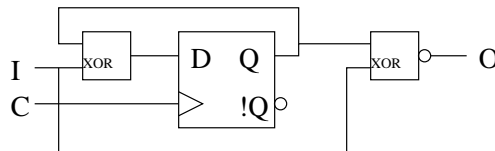
## 2 Reverse Engineering Sequential Circuits

Analysis = reverse engineering.

One doesn't ordinarily do this, but doing so will help with sequential circuit design.

## 3 Input Equations, State Tables, and State Diagrams

Consider the following sequential circuit:



What does it do — high level?

What happens if we use !Q as the input to the XOR rather than Q?

Mealy (this circuit) vs. Moore machines.

### 3.1 Input Equations

What are the equations for O and D (input equation)?

Do these differ that much from anything we've already seen?

### 3.2 State Tables

State tables are similar to truth tables, with two additions:

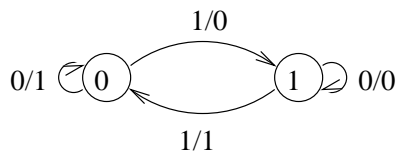
1. Present state inputs — flip-flop outputs.
2. Next state outputs — derived from input equations for flip-flops.

Present State	I	Next State	O
0	0	0	1
0	1	1	0
1	0	1	0
1	1	0	1

### 3.3 State Diagrams

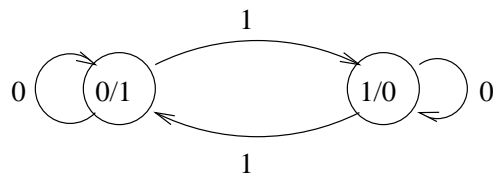
Conveys same information as state table, in a visual form.

State diagram for our example (Mealy):



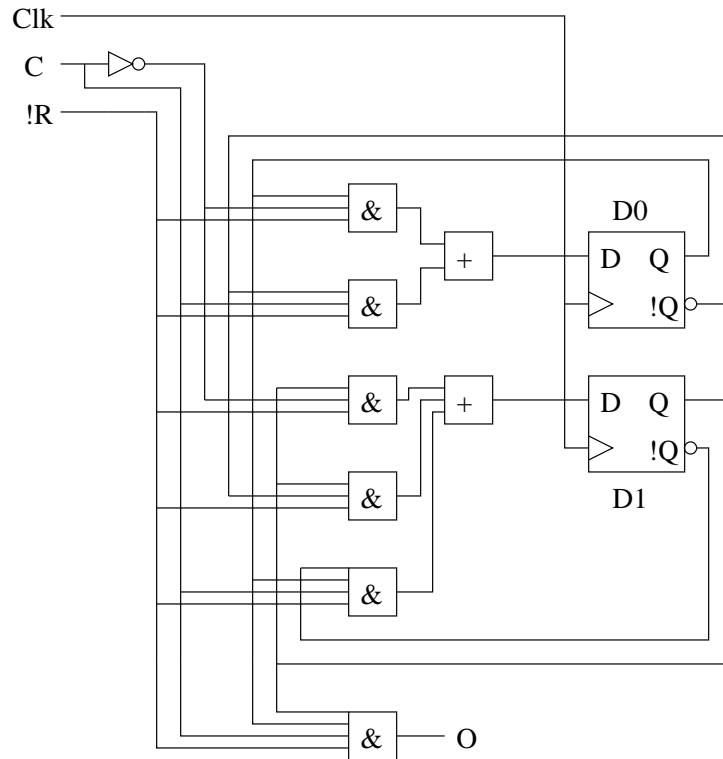
How do I read this?

Moore machine example:



## 4 Example

Determine input and output equations, state table, and state diagram for this circuit:



Is this Mealy or Moore?