

Karnaugh Maps for Programming

```

if (((S <6)&&(L>10)) ||
    ((S>=6)&&(N==G)&&(L>10)) ||
    ((N==G)&&(L<=10)) ||
    ((S>=6)&&(N==G)) ||
    ((S>=6)&&(N!=G)&&(L>10)) ) {

    print "OK";
}
    
```

Fill Table with IF Clauses

S is (S>=6) L is (L>10) N is (N==G)
 ~S is (S<6) ~L is (L<=10) ~N is (N!=G)

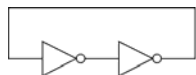
	~S ~N	~S N	S N	S ~N
~L	0	1	1	0
L	1	1	1	1

```

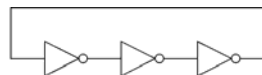
if ((N==G) || (L>10))
    
```

Feedback

- Combinatorial circuits do not have feedback.



(a) Stable circuit

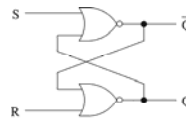


(b) Unstable circuit

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SR Flip Flops

- Can remember a bit
- A NOR gate implementation of SR latch



(a) Circuit diagram



(b) Logic symbol

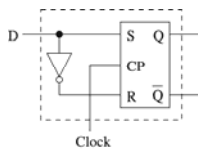
S	R	Q _{n+1}
0	0	Q _n
0	1	0
1	0	1
1	1	0

(c) Truth table

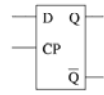
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D Flip-Flop

- The D latch or flip flop avoids the SR = 11 state
- Consider the clock as an "enable" signal.



(a) Circuit diagram



(b) Logic symbol

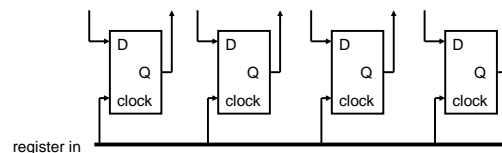
D	Q _{n+1}
0	0
1	1

(c) Truth table

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Register Organization

- Below is a 4 bit register made of D flip-flops.
- When the clock is true, the output of all flip-flops is set to the input value.
- The output is always the last input value.



register in