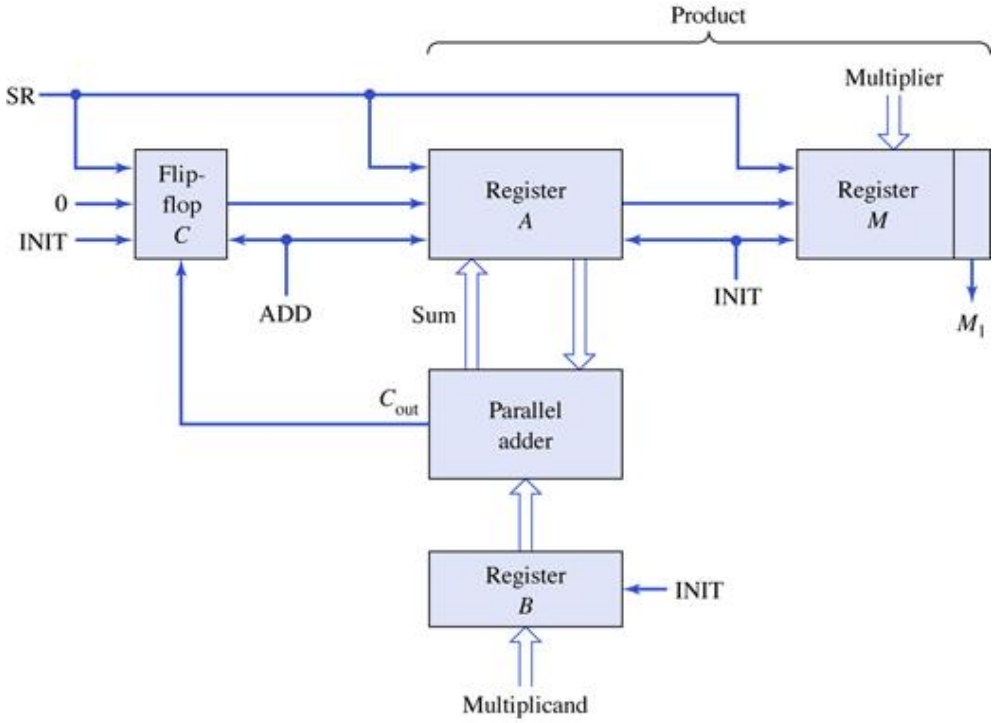
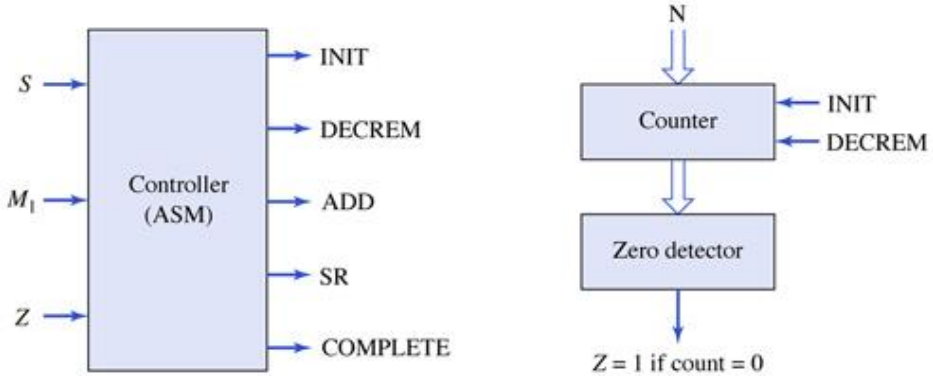

Product
Multiplier
SR
Flip-
flop
C
0
INIT
ADD
Register
A
Sum
Register
M
INIT
$M_1$
$C_{out}$
Parallel
adder
Register
B
INIT
Multiplicand


S
$M_1$
Z
Controller
(ASM)
INIT
DECREM
ADD
SR
COMPLETE
N
Counter
INIT
DECREM
Zero detector
Z = 1 if count = 0

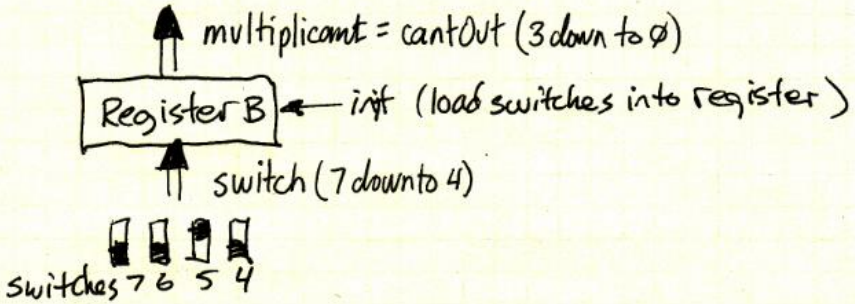
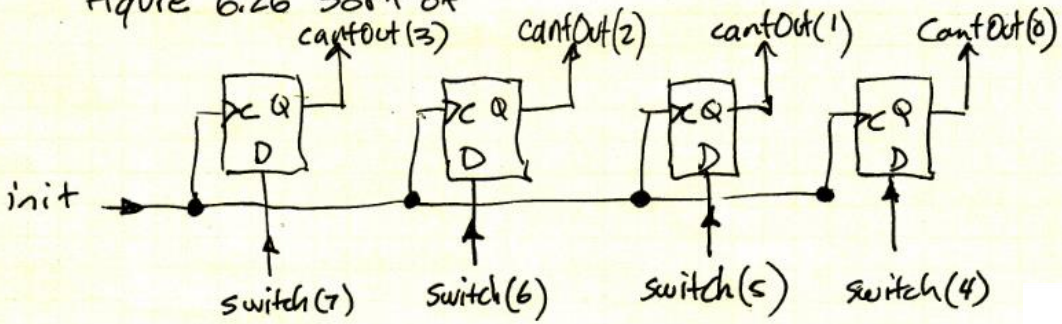
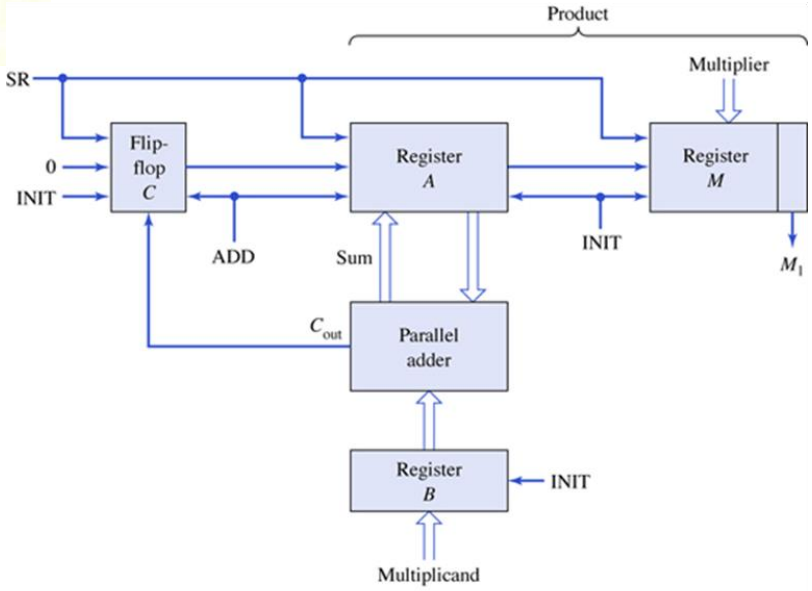



Figure 6.26 Sort of



# Parallel Adder

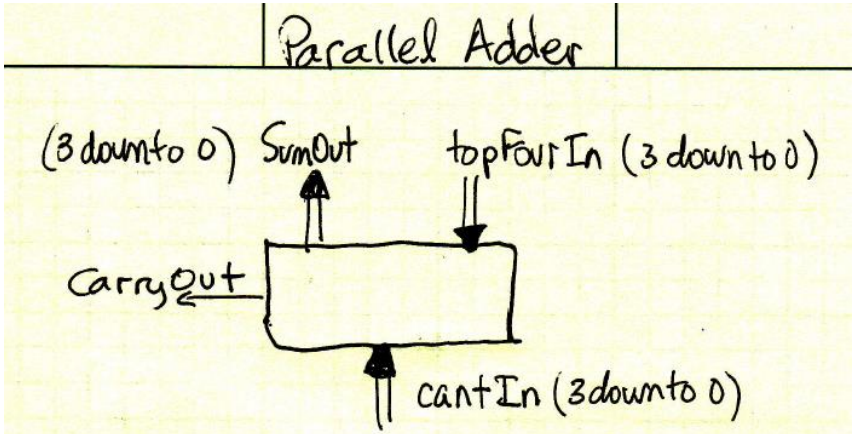
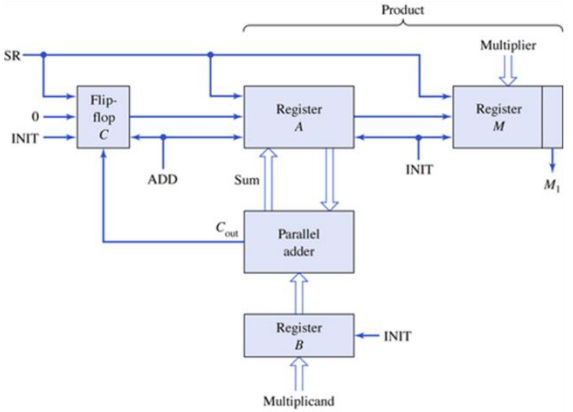
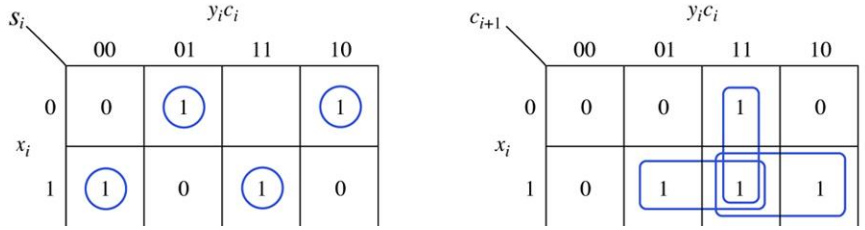
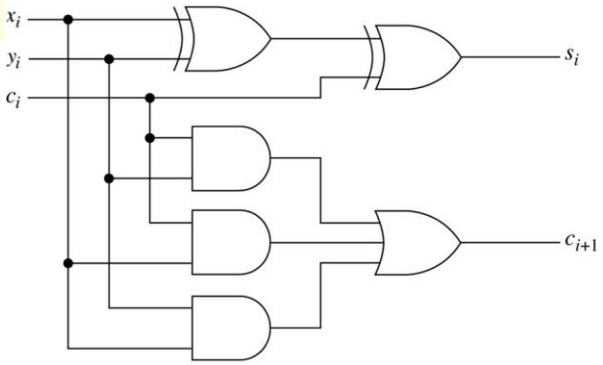
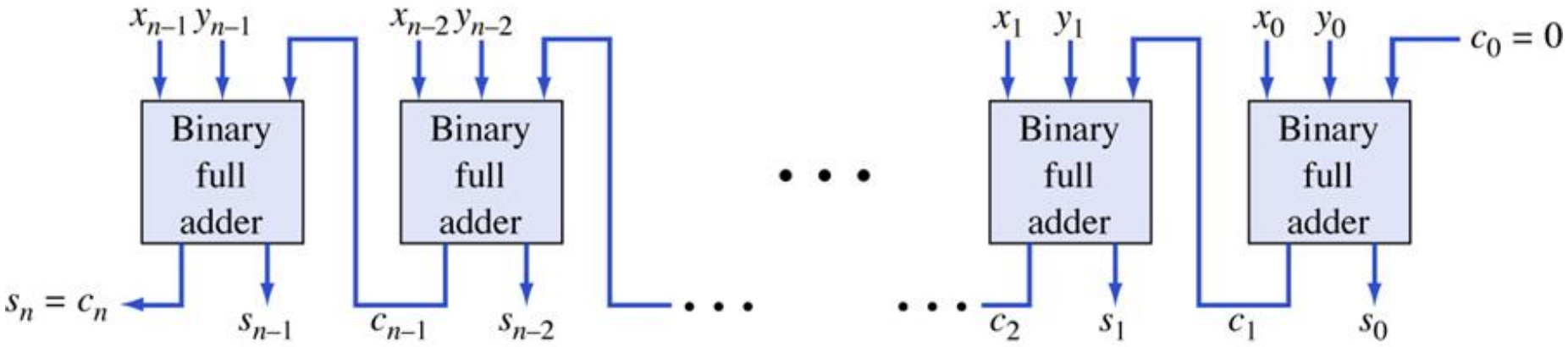


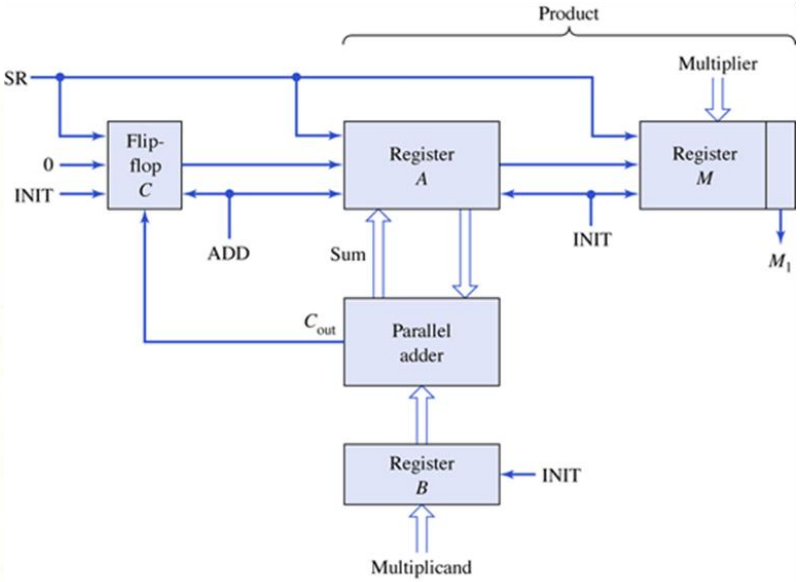

Fig. 5.2 & 5.4 from text
Need 4 individual adders,
Then build parallel adder.





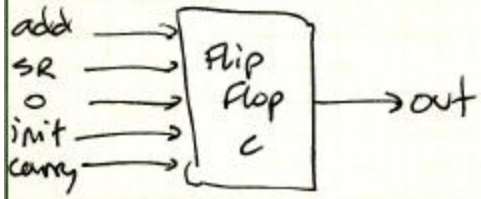
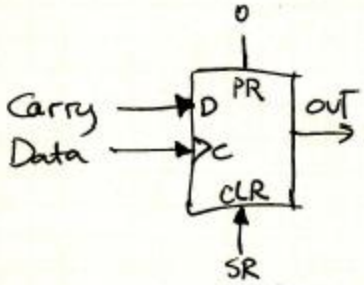




Fig 6.21 tie $\overline{PR}$ to a 1 then whats left is:

| $\overline{CLR}$ | D | C | Q | |
|---|---|---|---|---|
| 0 | X | X | 0 | no matter what, make Q = 0 |
| 1 | 0 | ↑ | 0 | follow D (clock) going up. |
| 1 | 1 | ↑ | 1 | follow D (clock going up.) |
| 1 | X | 0 | Q | } hold Q value if clock not changing |
| 1 | X | 1 | Q | } |

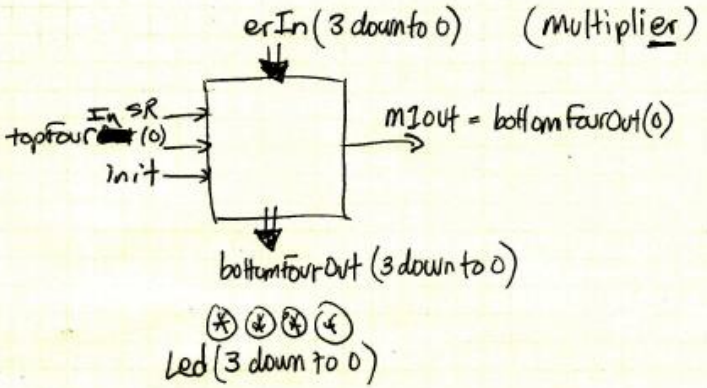
So if Clock = Data, then ~~de~~ carry will appear at output
if D = carry, then rising edge will capture carry in flip flop, and present it on Q.

So would look like this:




needs to be master slave, otherwise SR (clear) may wipe out any carry before gets into Register A.

Register M.




Looks like Figure 6.28 in text:

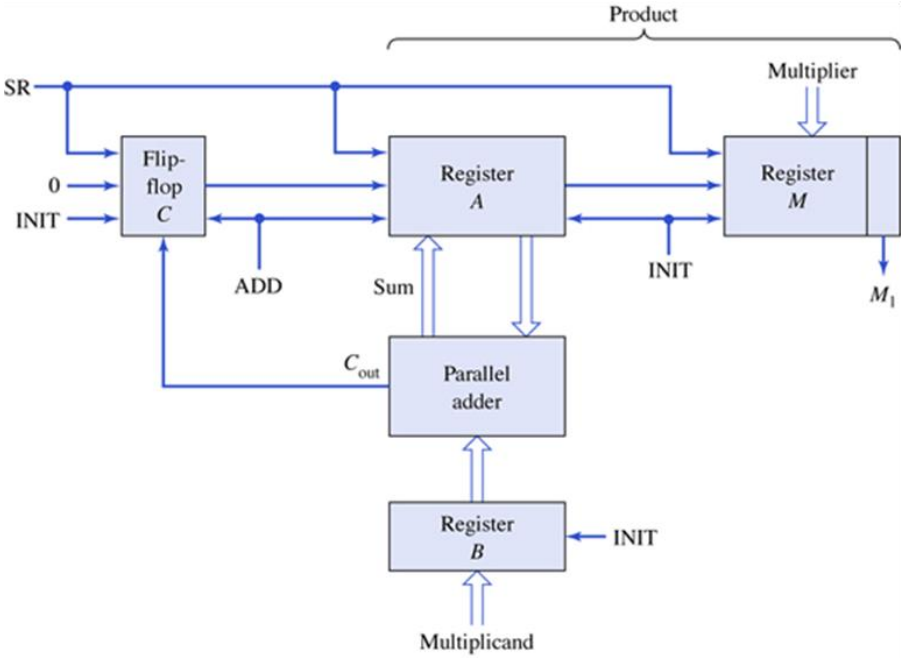
Serial Data In = topFourIn(0)

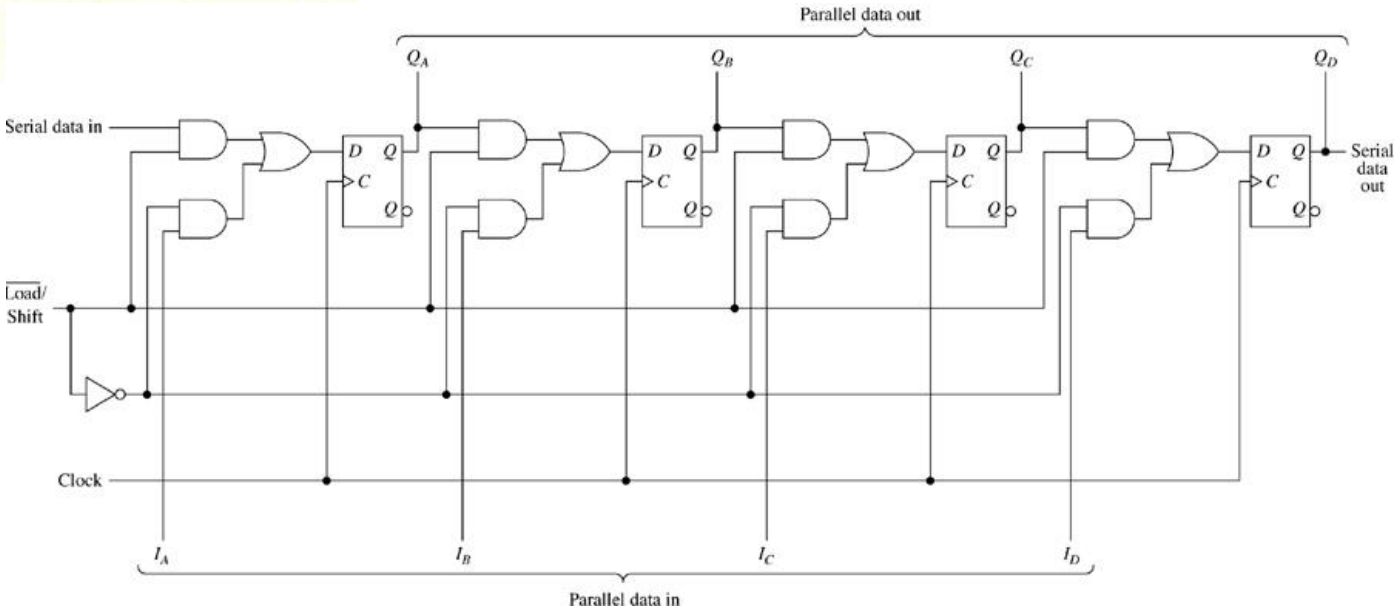
Serial Data out (not connected).

Parallel Data In ($I_A$ $I_B$ $I_C$ $I_D$) = erIn (3 down to 0).

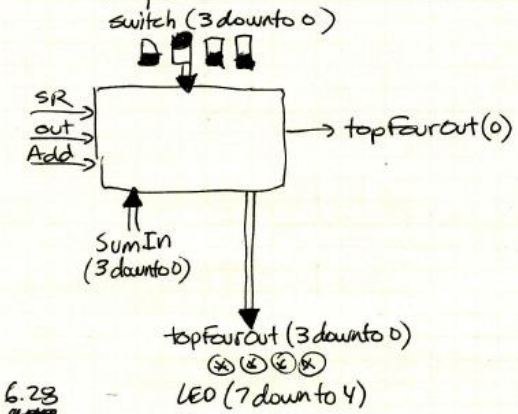
Shift = $\overline{\text{init}}$

Clock = SR.



Register A




6.28

Fig [redacted] in text

Serial Data In = out (out from flip flop)

Clock = SR (shift right)

$\overline{LOAD}$/Shift = $\overline{DATA}$

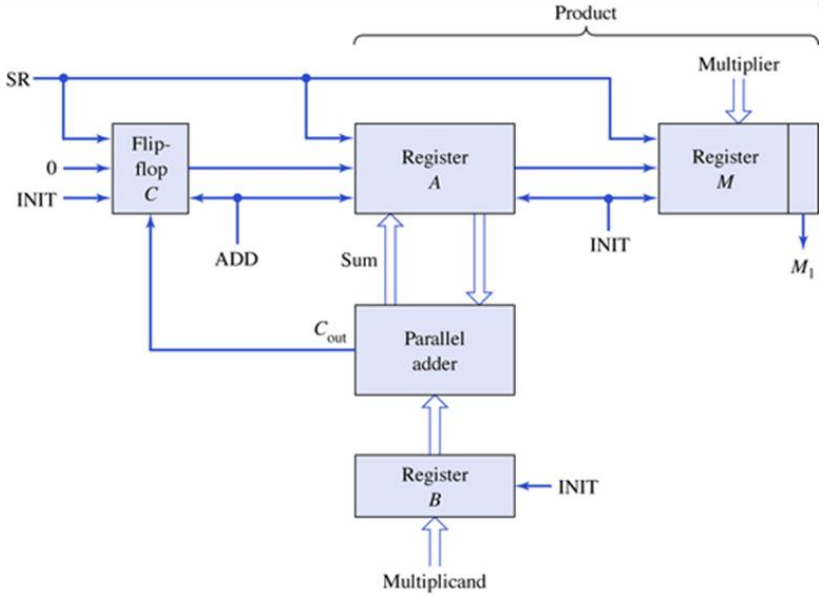
when DATA = 0 then want to open possibility of serial in.

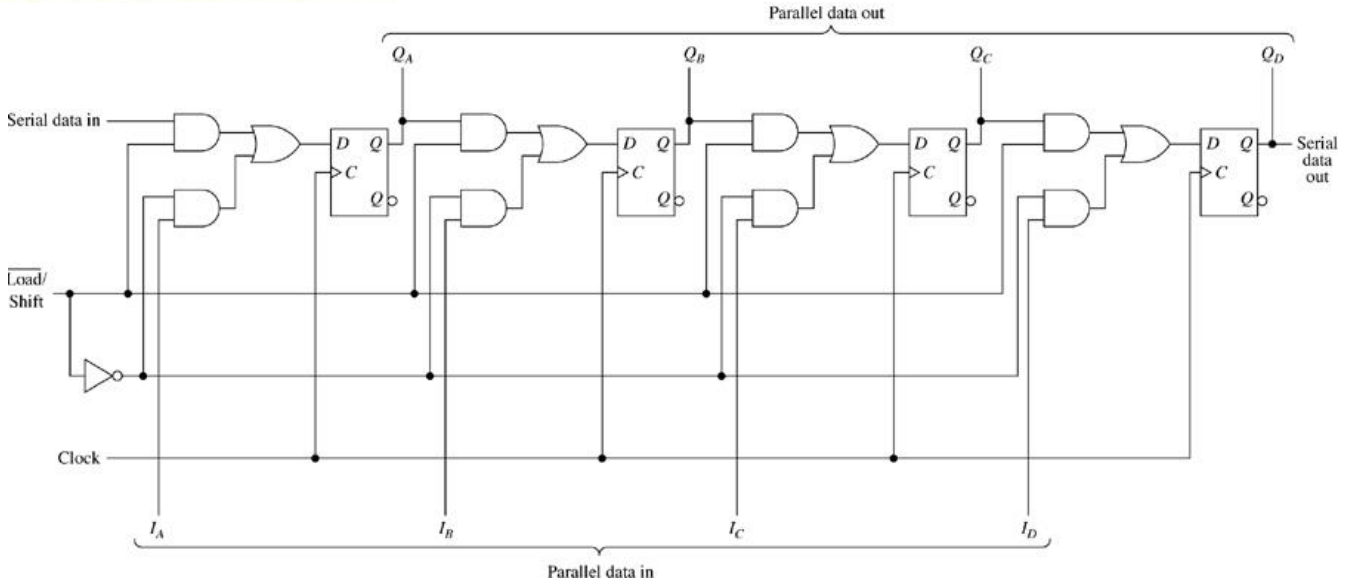
when DATA = 1 then want to load SumIn.

$I_A - I_D$ = Sum In

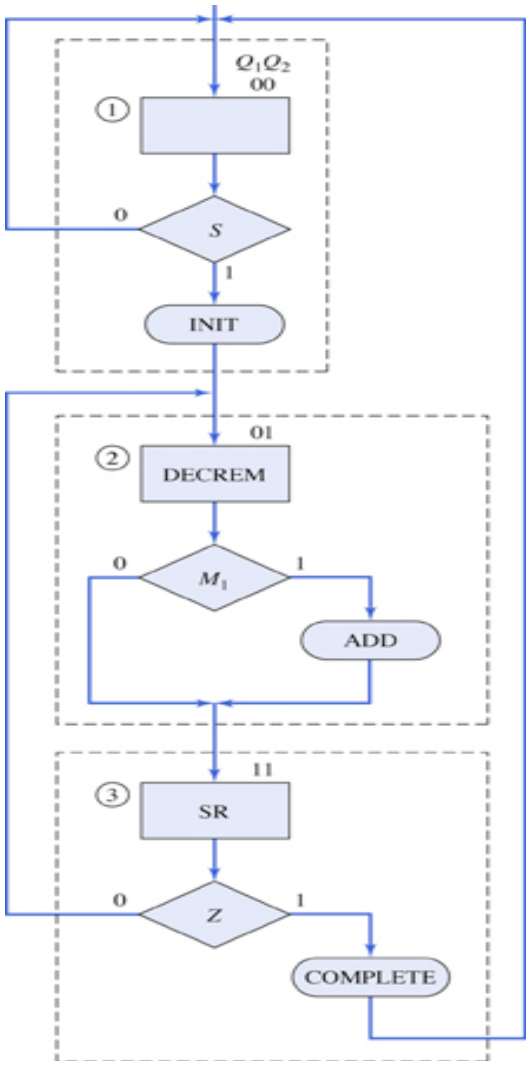
$Q_A - Q_D$ = top Four Rout (3 down to 0)

Serial out = toFourOut(0)



# ASM CHART



# Plan

- 3-state ASM
  - Initialize
  - Add or not
  - Shift + Zero Detector
- Modules
  - parallel adder
  - Shift Registers or Latches