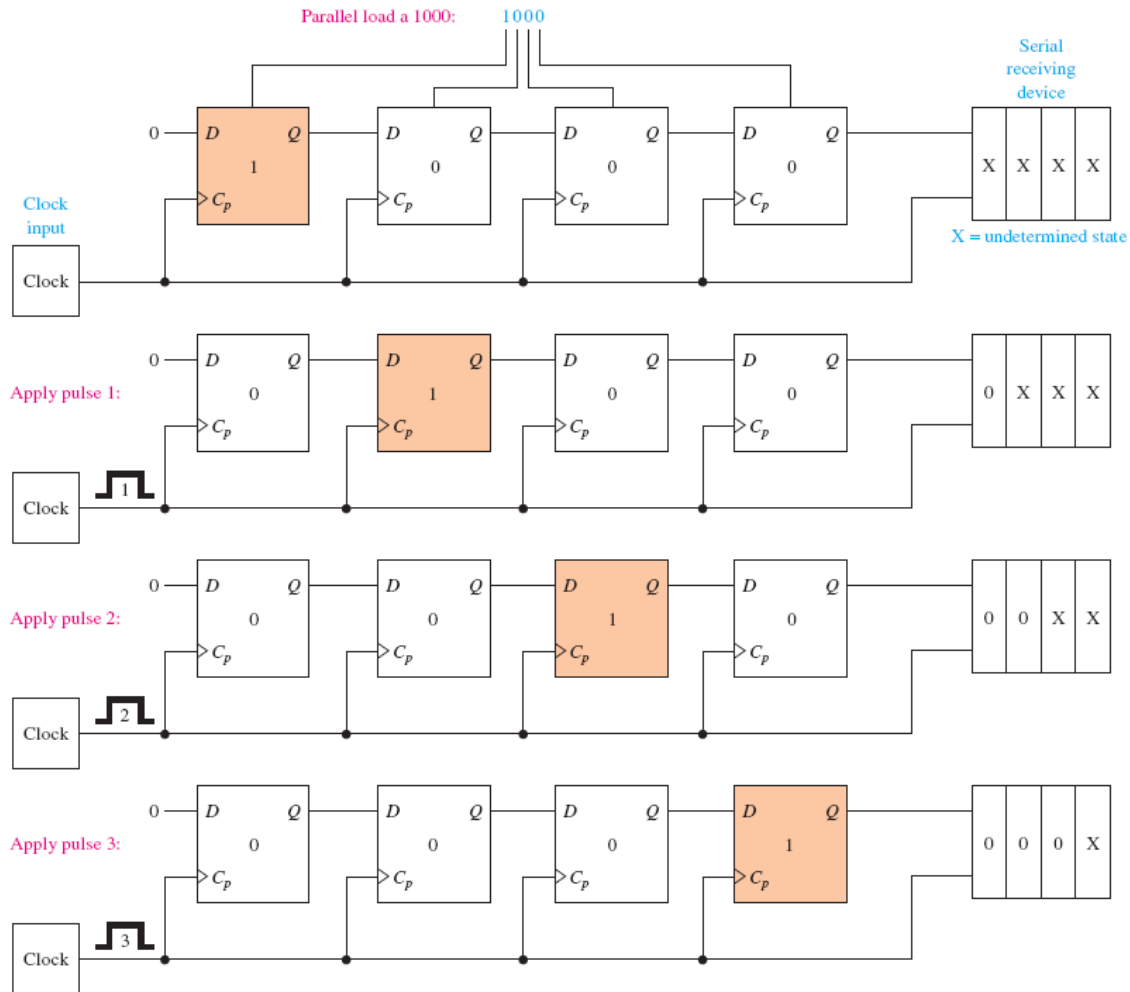


Šift registri, SRAM, DRAM, ROM

# Šift registar

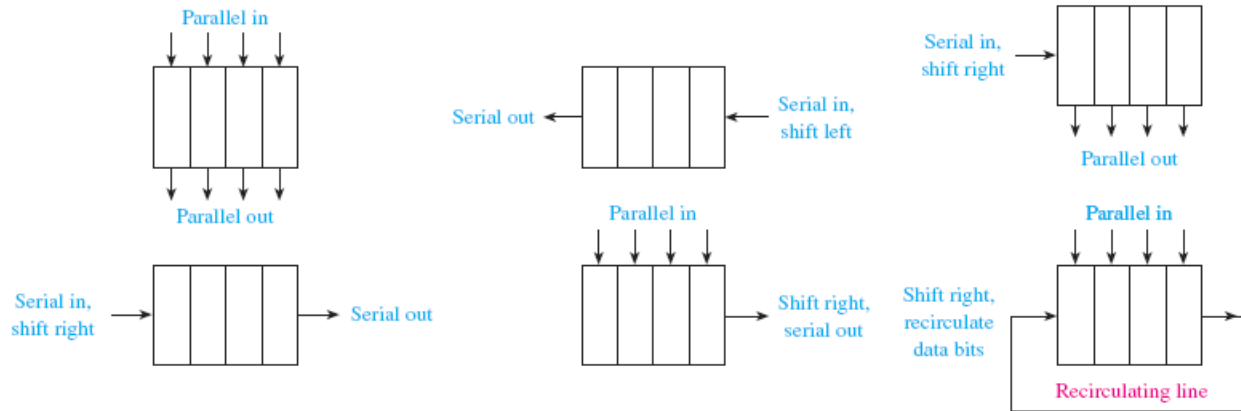
## konverzija iz paralelnog u serijski



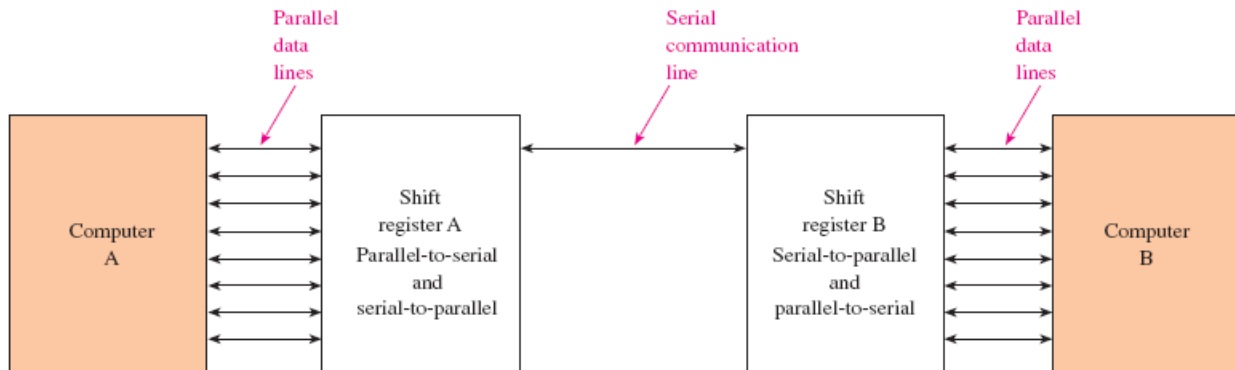
# Ostale primene

- Serijski u serijski
- Paralelni u paralelni
- Serijski u paralelni
- Šiftovanje ulevo i udesno
- Široke primene u komunikacionim tehnologijama

# Primer komunikacija 2 računara



(a)



(b)

# Memorijske tehnologije

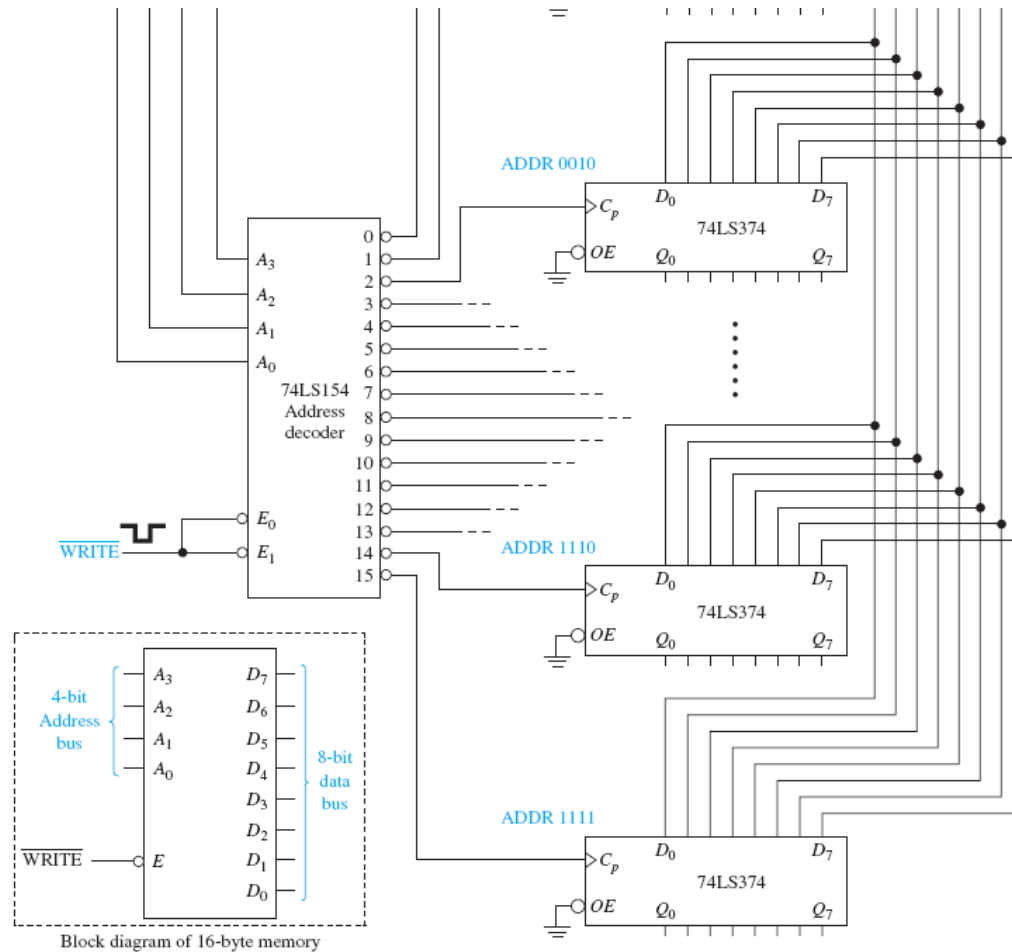
- Poluprovodničko integrirano kolo
  - Jako brzo
- Magnetni medijum (traka ili disk)
  - Sporo
- Optički medijum (CD ili DVD)
  - Sporo
  - Veliki kapacitet

# Primer memorije u IC tehnologiji

4-Bit address (location)	8-Bit data (contents)
0000	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
0001	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
0010	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
0011	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
0100	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
⋮	⋮
1101	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
1110	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐
1111	┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐┌───┐

16 Bytes of data

# Primer memorije u IC tehnologiji

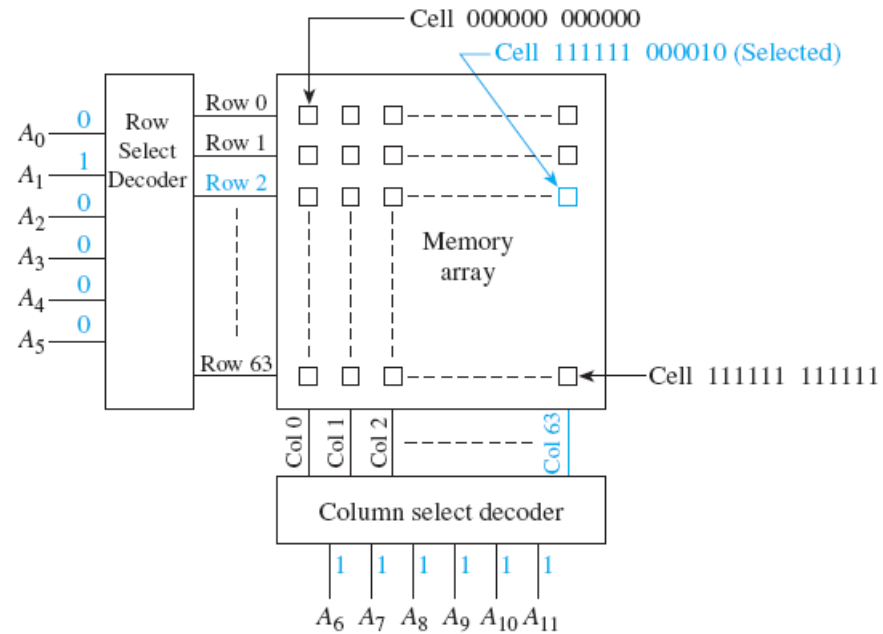


# Static RAM (SRAM) vs Dynamiki RAM (DRAM)

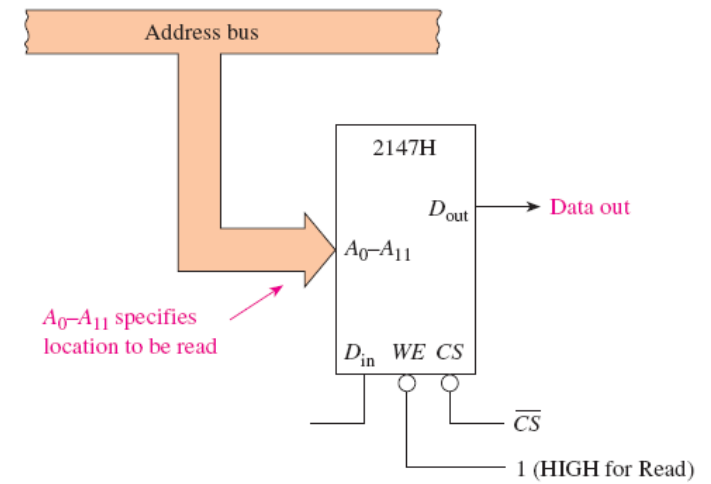
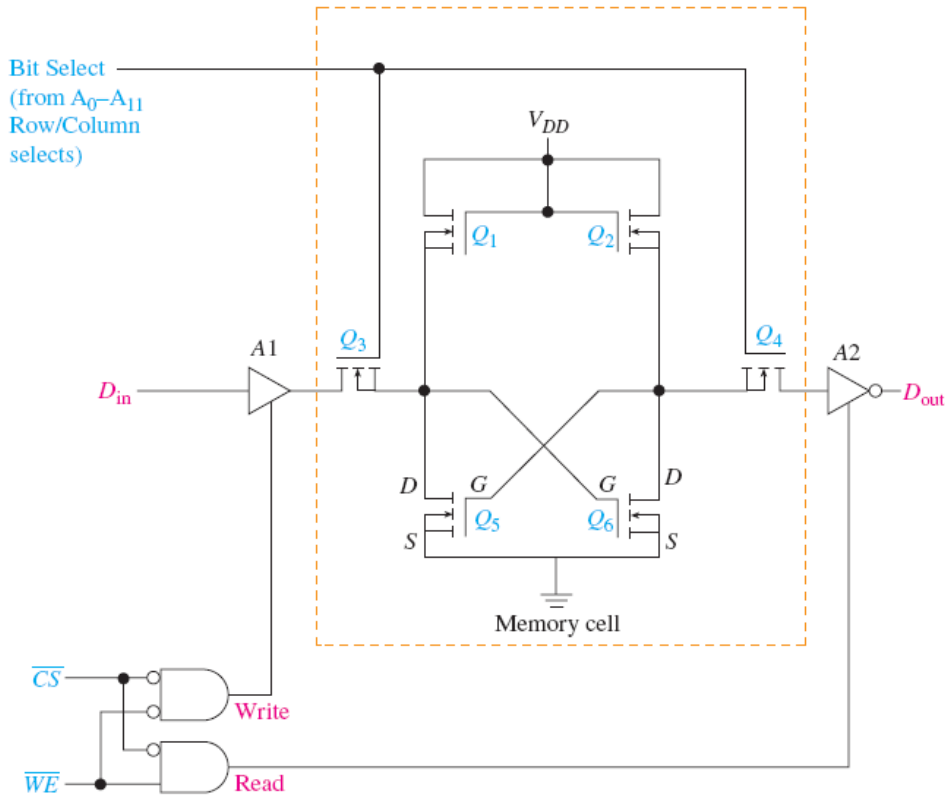
- SRAM - Flip flopovi se koriste kao osnovne memorijske jedinice
  - Skuplji po bitu
  - Manji memorijski kapaciteti
  - Brži
- DRAM – Interni kondenzatori
  - Jeftiniji po bitu
  - Zahteva osvežavanje
  - Tehnički zahtevniji
  - Veći memorijski kapaciteti (veća gustina – manji fizički prostor po bitu)
  - Sporiji zbog trajanja promene napona kondenzatorima



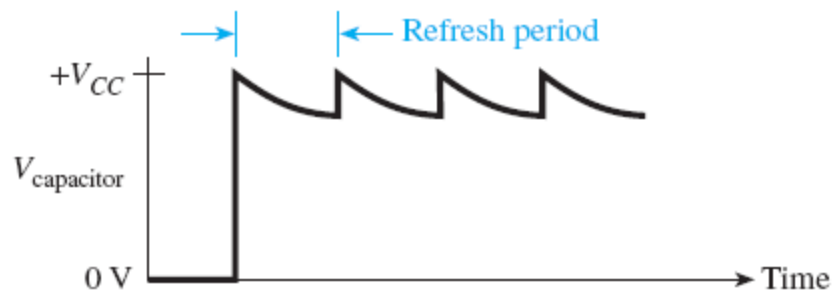
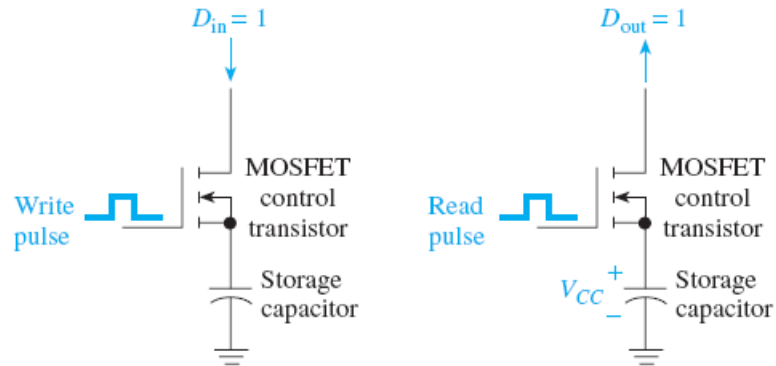
# SRAM 2147H 4K



# Pojedinačna SRAM ćelija



# Pisanje i čitanje po DRAM ćeliji



# ROM (Read only memory)

- Slučajan pristup (random access)
- Ne gube sadržaj kad se izgubi napon
- EPROM – ROM sa mogućnošću brisanja
- EEPROM – programabilna memorija
- Flash memorija - programabilna

# Pregled svih bitnijih vrsti memorija

Memory Type	Basic Cell Structure	Volatile	In-Circuit Rewriteable	Density	Comments
SRAM	Cross-connected MOSFETs	Yes	Yes	Low	Fastest speed makes them well suited for PC cache memory.
DRAM	MOSFET with capacitor	Yes	Yes	High	Slower than SRAM, but extremely high density. Used for PC main RAM memory.
Mask ROM	MOSFET	No	No	High	High initial cost, but useful for high production runs such as PC BIOS.
PROM	MOSFET with fused link	No	No	High	Program once; used for small-volume or trial circuits and data tables.
EPROM	Floating-gate MOSFET	No	No	High	Slow erasure time, but very high density and fast access time. Used for initial troubleshooting and design.
EEPROM	Floating-gate MOSFET	No	Yes	Low	Small size and ability to rewrite make it useful for handheld portable electronic devices.
Flash	Floating-gate MOSFET	No	Yes	High	Extremely high density and ability to rewrite facilitate portable megabyte memory like the Flash card.

# Primer organizacije EPROM memorijskog sistema

