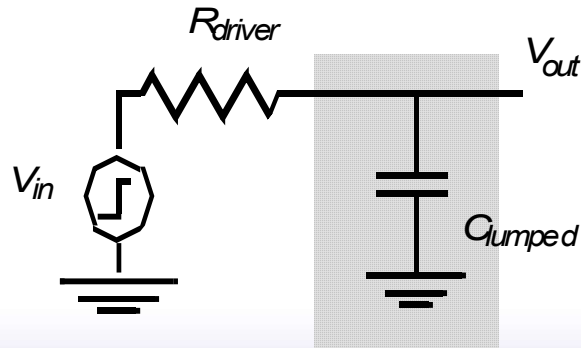
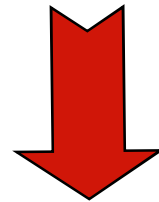
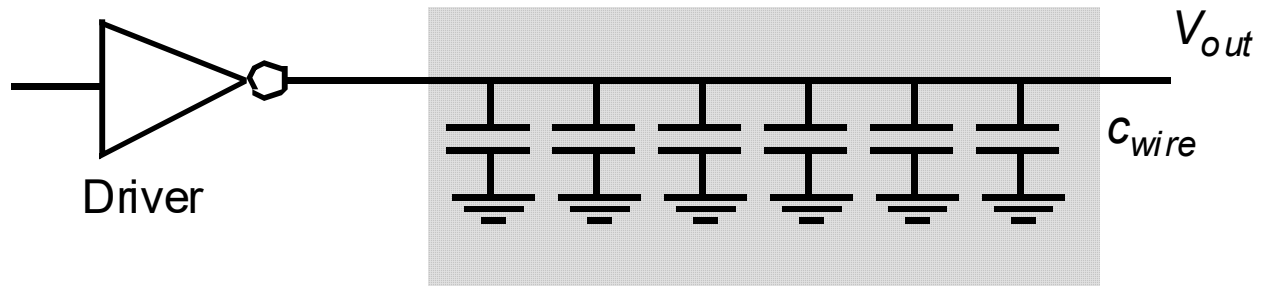


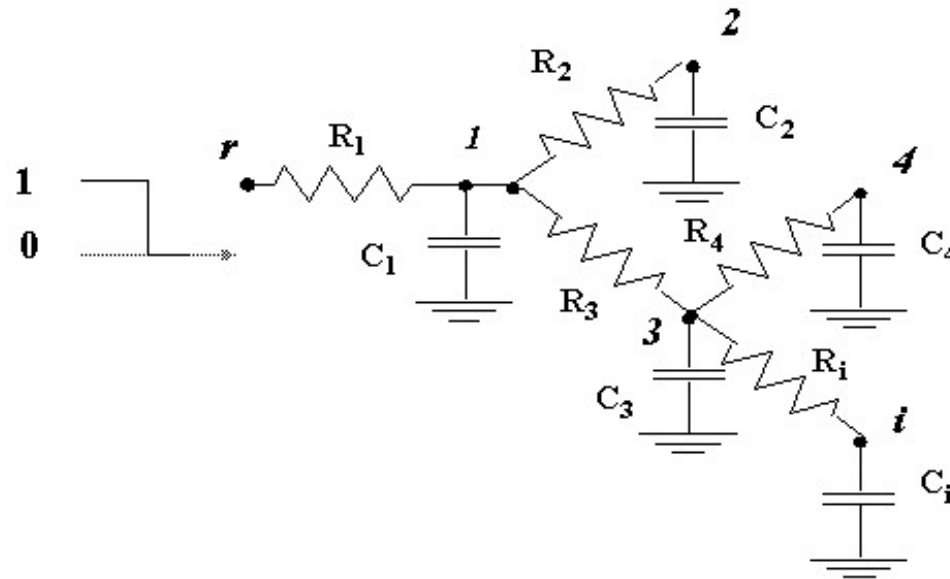
# *Interconnect Modeling*

# The Lumped Model



# The Lumped RC-Model

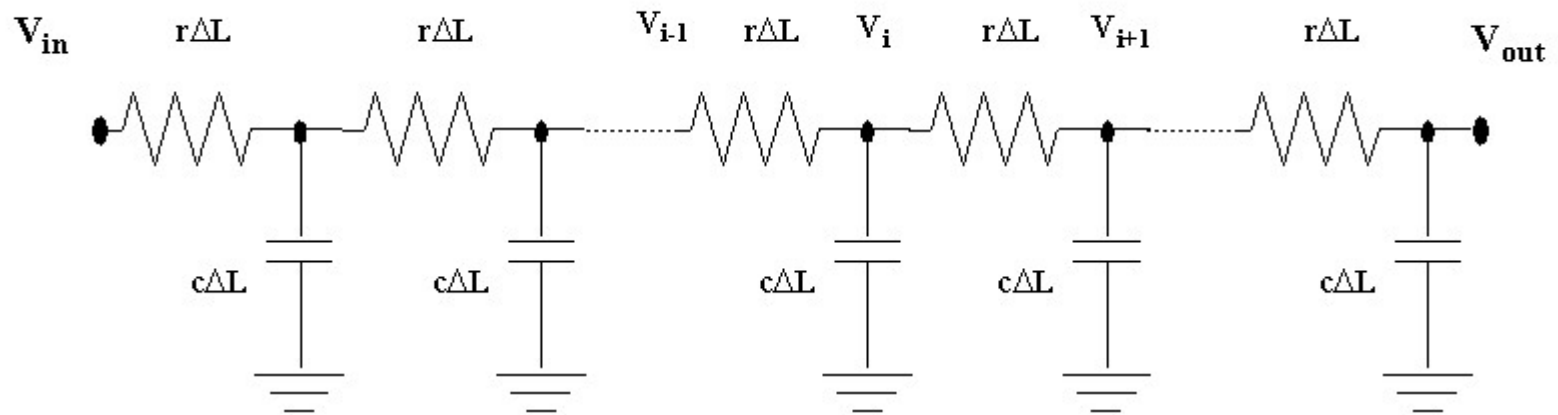
## The Elmore Delay



$$R_{ik} = \sum_N R_j \Rightarrow (R_j \in [path(s \rightarrow i) \cap path(s \rightarrow k)])$$

$$\tau_{Di} = \sum_{k=1}^N C_k R_{ik}$$

# The Elmore Delay RC Chain



$$\tau_N = \sum_{i=1}^N R_i \sum_{j=i}^N C_j = \sum_{i=1}^N C_i \sum_{j=1}^i R_j$$

# Wire Model

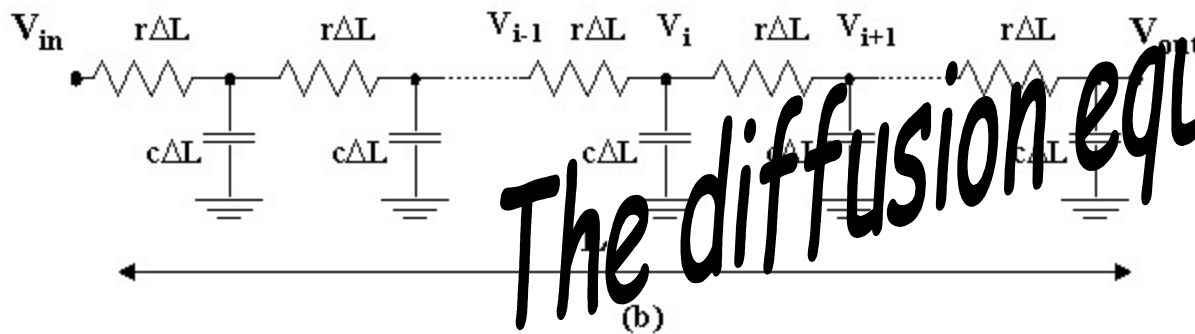
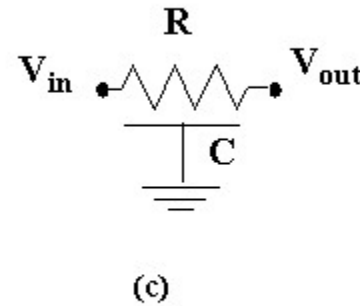
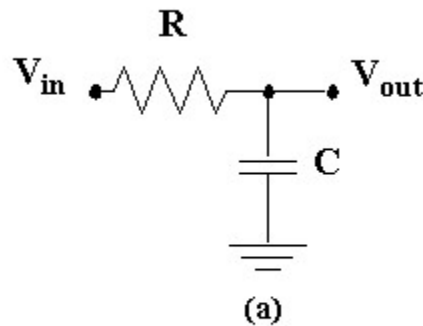
Assume: Wire modeled by N equal-length segments

$$\tau_{DN} = \left(\frac{L}{N}\right)^2 (rc + 2rc + \dots + Nrc) = (rcL^2) \frac{N(N+1)}{2N^2} = RC \frac{N+1}{2N}$$

For large values of N:

$$\tau_{DN} = \frac{RC}{2} = \frac{rcL^2}{2}$$

# The Distributed RC-line



*The diffusion equation*

$$rc \frac{\partial V}{\partial t} = \frac{\partial^2 V}{\partial x^2}$$

$$\tau(V_{out}) = \frac{rc L^2}{2}$$

# Step-response of RC wire as a function of time and space

