

1. Considering the following figure from R. P. Lippmann [MIT Tech Report 769, 31 May 1987, p. 11] for finding the maximum of eight real numbers
 - a. Give a figure for finding which is the maximum of four numbers and prove that the maximum is indicated.
 - b. Add an output which gives the value of the maximum. Do the same for Lippman's figure.
 - c. Set up a Simulink model for your system.
 - d. Repeat for the case of three and of five numbers.

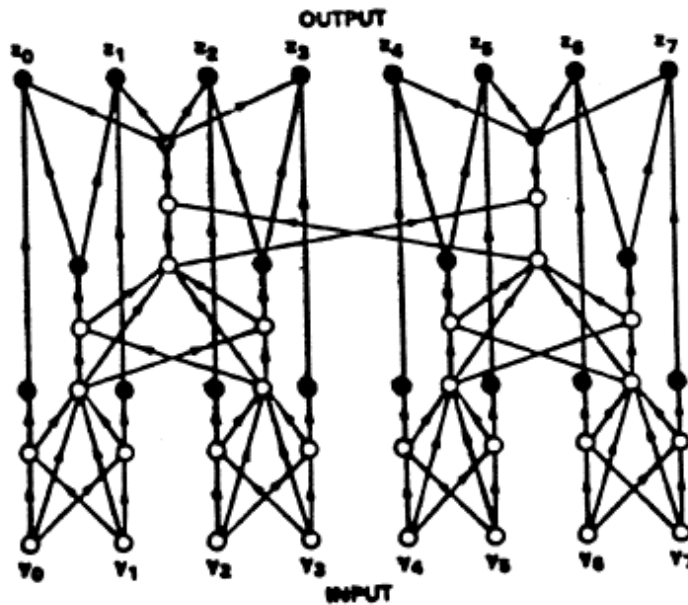


Figure 6. Feed-forward neural net that determines which of eight inputs is maximum using a binary tree and comparator subnets from Figure 5. Binary thresholds on both hard-limit nodes (filled circles) and analog-threshold logic nodes (open circles) are zero except for the output nodes. Binary thresholds on nodes $z_0, z_1, \dots, z_4, z_7$ are -2.5 . Weights for all comparator subnets in this net are as in Figure 5. All other weights are $+1$.

2. For the following MAXNET diagram from J. M. Zurada, [Introduction to Artificial Neural Networks, West 1992, p. 394]
 - a. Explain how it works
 - b. Set up a Simulink simulation of it.

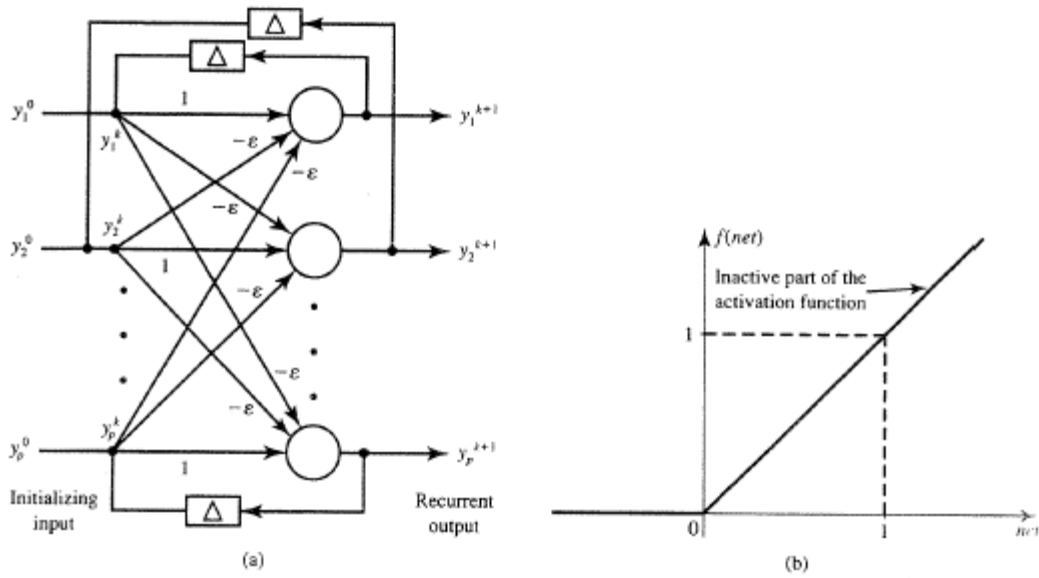


Figure 7.3 MAXNET for p classes: (a) network architecture and (b) neuron's activation function

the initializing inputs fulfilling conditions

$$0 \leq y_i^0 \leq 1, \quad \text{for } i = 1, 2, \dots, p$$

3. Design a system which will take the minimum of a set of real numbers. .
4. Conceive CMOS circuits to realize any of these systems.