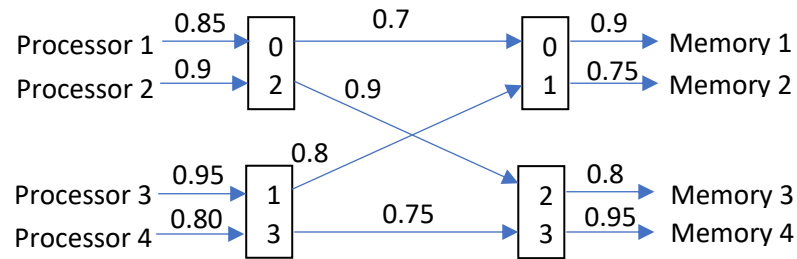


ECN 2022 Assignment



1. [10 + 10 + 15 + 25] The 2-stage butterfly network shown above connects a set of four processors at its inputs to a set of four memory modules at its outputs. All processors generate memory requests with the same probability 0.3 per cycle. Each such memory request may be directed to any of the memory modules with equal probability. In the figure, the numbers above each link give the probability of the link being non-faulty. Neglect switchbox failures. Answer the following questions with step-wise explanations.
 - a. What is the probability that the bottom output line of the top switchbox at stage 0 will carry a memory request?
 - b. What is the probability that processor 3 can connect to at least one of the memory modules at the output end of the network?
 - c. How do the obtained probabilities for the questions in parts a and b change with the addition of an extra stage, all of whose incident links have failure probability 0.1?
 - d. What is the bandwidth, connectability and expected number of accessible processors in the above network when all switchboxes have a failure probability of 0.01?