P4. Consider the circuit-switched network in Figure 1.13. Recall that there are four circuits on each link. Label the four switches A, B, C, and D, going in the clockwise direction.

a. What is the maximum number of simultaneous connections that can be in progress at any one time in this network?

b. Suppose that all connections are between switches A and C. What is the maximum number of simultaneous connections that can be in progress?

c. Suppose we want to make four connections between switches A and C, and another four connections between switches B and D. Can we route these calls through the four links to accommodate all eight connections?

Answer:

a. The maximum number of simultaneous connections that can be in progress at any one time in this network is determined by the number of circuits on each link multiplied by the number of links. Since each link has four circuits, and there are four links, the maximum number of simultaneous connections is

4×4=16.

b. If all connections are between switches A and C, we can utilize all four links between A and C. Since each link has four circuits, the maximum number of simultaneous connections between switches A and C is still 4×4=16.

c. If we want to make four connections between switches A and C, and another four connections between switches B and D, we need to ensure that each pair of connections uses different links. However, in this network, there are only four links available. Therefore, we cannot route all eight connections through the four links without reusing links, which would result in conflicts. Therefore, it is not possible to accommodate all eight connections simultaneously without reusing links.