ECE 158B, Homework Set 1, Spring 1999

1. Draw a 16 input, 16 output Benes network. Label the inputs and outputs from 0 to 15, top to bottom. By indicating a "bar" (=) or a "cross" (X) on each of the 2 X 2 switches, show how input i can be routed to output $3i$ (mod 16) for all $i = 0, 1, 2, \ldots, 15$.

2. Using the variant of the Clos construction described in class, draw an 8 input, 8 output non-blocking interconnection network, using 2 X 2 switches, 2 X 3 switches, and 3 X 2 switches, that does not require rearrangement of existing connections in order to route new connections. Indicate graphically a possible state of each 2X2,2X3, and 3x2 switch in order to route input i to output $3i$ (mod 8) for all i, where the inputs and outputs are labelled from 0 to 7, top to bottom.

3. Consider a Time-Space-Time circuit switch, as described in class. There are 4 input links and 4 output links. Each input and output link has equal length frames consisting of 5 slots. Thus, there are 5 channels per link, 20 total input channels, and 20 total output channels. The input and output links are labelled 0 to 3, top to bottom. Channels 0 to 4 reside on link 1, channels 5 to 9 reside on link 2, etc. Through appropriate drawings, show how the switch can route input channel i to output channel $3i$ (mod 20) for all i. In other words, you should describe the state of each time slot interchanger and the states of the space switch over time, in order to permute the 20 channels as specified above.

4. Using 2X2 sorters (comparators), draw a 16 element (general) sorting network using Batcher's recursive bitonic construction.