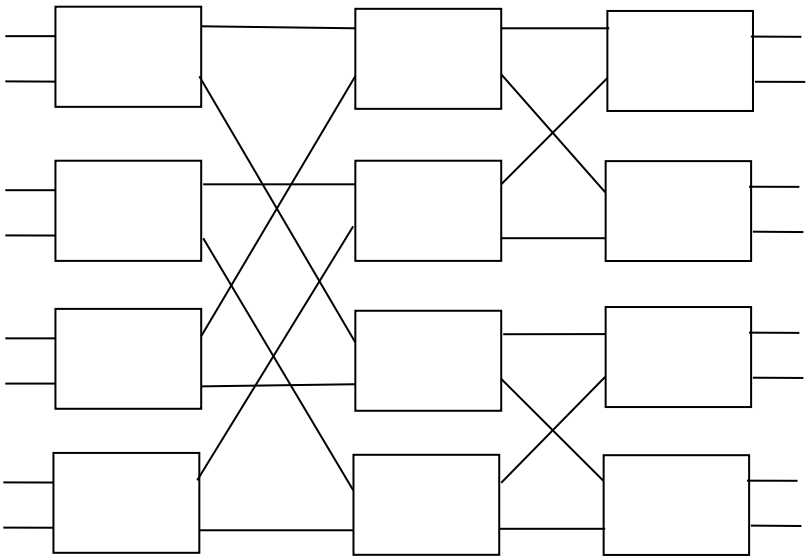
City University of Hong Kong
Department of Electrical Engineering

EE3009 Data Communications and Networking

Tutorial 2

1. The figure below shows an 8x8 Banyan switch. The input and output ports are numbered from 0 to 7, respectively.



i) A packet is destined to output port 3. Convince yourself that no matter which input port at which the packet arrives, it will be switched to the output port 3.

ii) A packet destined to output port 4 arrives at input port 0, another packet destined to output port 5 arrives at input port 4. What problem do you notice when these two packets are switched through the fabric?

2. Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00000000 11111111 11111111	0
11100000 00000001 00000000 00000000 through 11100000 00000001 11111111 11111111	1
11100000 00000010 00000000 00000000 through 11100000 00000011 11111111 11111111	2
otherwise	3

a. Provide a forwarding table that has five entries, uses longest prefix matching, and forwards packets to the correct link interfaces.
b. Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:
   11111000 10010001 01010001 01010101
   11100000 00000000 11000011 00111100
   11100001 10000000 00010001 01110111

3. Suppose a router receives an IP packet containing 600 data bytes and has to forward the packet to a network with maximum transmission unit of 200 bytes. Assume that the IP header is 20 bytes long. Show the fragments that the router creates and specify the relevant values in each fragment header (i.e., total length, fragment offset, and more bit).

4. Identify the address class of the following IP addresses: 200.58.20.165; 128.167.23.20; 16.196.128.50; 150.156.10.10; 230.10.24.96.

5. Convert the IP addresses in the previous question to their binary representation.

6. Identify the range of IPv4 network addresses spanned by Class A, Class B, Class C and Class D.