Course S-38.3165 (Switching Technology) exam questions, May 10, 2006

1. Answer the following switch fabric related questions.

   a.) What is meant by Head of Line (HOL) blocking?

   b.) What is the difference between a strict-sense non-blocking and a rearrangeably non-blocking switch fabric?

   c.) How many separate point-to-point connection patterns, which occupy all outlets of a switch fabric, can be set up through an *MxN* switch?

2. Calculate the reliability (R) and failure probability (F) of the below given systems when failures of the sub-systems in both cases are independent of each other.

   a.) $R_1 = 0{,}95$, $R_2 = 0{,}95$, $R_3 = 0{,}9$, $R_4 = 0{,}9$ ja $R_5 = 0{,}85$
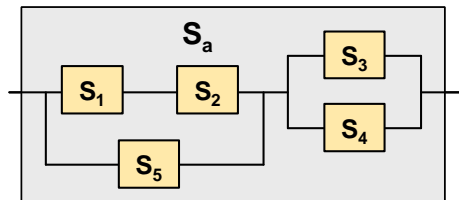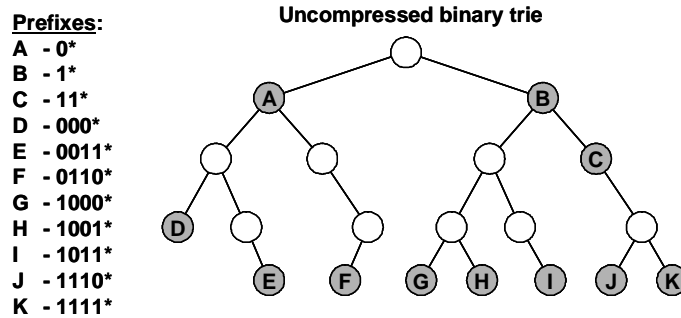

   b.) $R_1 = 0{,}8$, $R_2 = 0{,}85$, $R_3 = 0{,}9$
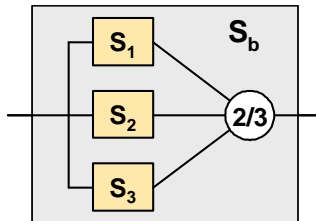
3. The switch fabric of a router is based on a 32-bit wide shared bus and the bus clock rate is 280 MHz. One 32-bit word is transferred across the bus in four bus clock cycles. It is also known that 10 % of the bus capacity is used for control of the routing device.

   a.) If the router is equipped with Fast Ethernet (100 Mbits/s) interfaces, then what is the maximum number of such interfaces that can be attached to the router without overloading the switching bus?

   b.) Assume that two Fast Ethernet interfaces are implemented on a single line card. If the card has a routing table, then how fast should the routing logic be to avoid loss of IP packets (due to the routing) in every possible loading situation?

   c.) Explain what kind of weaknesses and strengths do the bus type switch fabric implementations have. What solutions have been used to overcome the weaknesses?

4. Prefixes stored in a routing table form the binary trie given below.

Prefixes:
A - 0*
B - 1*
C - 11*
D - 000*
E - 0011*
F - 0110*
G - 1000*
H - 1001*
I - 1011*
J - 1110*
K - 1111*

Uncompressed binary trie

a.) Form a path compressed binary trie of the given binary trie.

b.) Form a multibit trie of the given binary trie, when the stride size $K = 2$.

c.) Form a Level Compressed (LC) trie of the given binary trie.

What is the maximum number of look-ups in each of the three cases?

5. In the below given all-optical LLN network, connections S_1 and S_2 are carried in the same waveband. Later connections S_3 is set up and it uses the same waveband as S_1 and S_2. Although each of the three connections occupies a separate wavelength, NAS 4 receives a corrupted signal after establishment of connection S_3.

a.) What is the reason for this?

b.) How to fix the problem?

c.) Is it possible to set up connections S_1, S_2 ja S_3 in the given network by using only one wavelength? Justify your answer.