Course S-38.165 (Switching Technology), Exam questions, January 17, 2005

1. A router is connected to the Internet with a GbE (Gigbit Ethernet) interface. The optical transport link exploits 8B10B block coding, data is carried in the standard Gigabit Ethernet frames and the "frame bursting" mode is not in use. Calculate

   a.) the maximum utilisation (%) and corresponding loss percentage (%)

   b.) the minimum utilisation (%) and corresponding loss percentage (%)

   of the link's transport capacity in respect of IP (Internet Protocol) packets.

2. Prove by using Paull's matrix that Clos-theorem $r^2 \geq m_1 + n_3 - 1$ holds.

3. Calculate reliability (R) and failure probability (F) of the below systems, given that in both cases failures in all sub-systems are independent.

   a.) $R_1 = 0.9$, $R_2 = 0.9$, $R_3 = 0.8$, $R_4 = 0.8$ and $R_5 = 0.85$
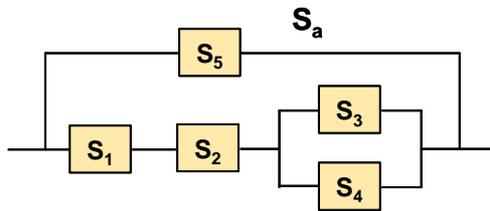
   b.) $R_1 = 0.9$, $R_2 = 0.8$, $R_3 = 0.8$ and $R_4 = 0.8$.
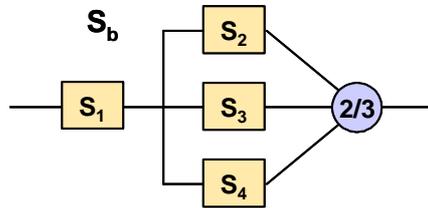
4. Optical Wavelength Routed Network (WRN) is a purely optical network.

   a.) What is meant in WRN networks by Routing and Channel Assignment (RCA) problem ?

   b.) What is meant in WRN networks by Wavelength Continuity Constraint and Distinct Channel Assignment Constraint ?

   c.) Four end-systems are connected by an optical bi-directional ring using static wavelength routing. How many wavelengths are needed to form full connectivity between the end-systems and what is the optical spectrum reuse factor ? Assume that elementary network access stations (NAS) are used.

5. Explain the following terms that are related to switch fabrics.

   a.) What is meant by full accessibility and by limited accessibility ?

   b.) What is meant by scalability of a switch fabric ?

   c.) Switch fabrics are divided into several categories in respect of blocking. Name these categories and explain the fundamental features of each category.