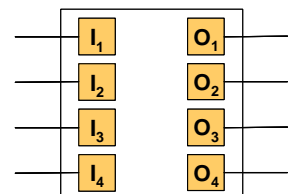


## Course S-38.3165 (Switching Technology) exam questions, December 15, 2006

1. Answer the following switching device related questions.
  - a.) What kind of a switching device is a self-routing switch?
  - b.) What is meant by an internally 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  $M \times N$  switch?
2. About circuit switched networks.
  - a.) Why is network synchronisation needed in conventional PDH and SDH network?
  - b.) The switchboard of a company has an E1 interface to the telecommunications network. During a rush hour, voice traffic between the switchboard and the telecommunications network is 44 Erlangs. How long is each voice channel (of the E1 interface) engaged during the rush hour on the average?
  - c.) Is there any difference between the buffering requirements of the switching devices in a circuit switched and packet switched networks? Explain why or why not.
3. The switch fabric of a router is based on a 64-bit wide shared bus and the bus clock rate is 200 MHz. One 64-bit word is transferred across the bus in four bus clock cycles. It is also known that 15 % of the bus capacity is used for control of the routing device.
  - a.) What is the maximum number of Fast Ethernet (100 Mbits/s) interfaces in the switching device to avoid overloading the switching bus?
  - b.) One interface card implements two Fast Ethernet interfaces. Given that each card has a routing table, how fast should the routing logic be to avoid loss of IP packets (due to the routing) in every possible loading situation?
  - c.) What are the strengths and weaknesses of a shared bus implementation?
4. About reliability of switching devices.
  - a.) On what bases can the faults of a switching device be categorised/classified?
  - b.) Reliability of a switching device is given by  $R(t) = e^{-\lambda t}$ . If  $\lambda = 50$  kfit, what is MTTF of the device?
  - c.) When three devices, which have reliability given in 5.b), are connected in tandem then what is MTTF of the formed system? Assume that failures in the three devices are independent.

5. A 4x4 optical switch (shown beside) is composed of wavelength multiplexers (WMUX) and wavelength demultiplexers (WDMUX).



- a.) Sketch the construction of the switch as the fabric is a static broadcast star. Add to the figure all required wavelengths ( $\lambda_i$ ) so that full connectivity becomes possible.
- b.) Sketch the construction of the switch as the fabric is a static wavelength router. Add to the figure all required wavelengths ( $\lambda_i$ ) so that full connectivity becomes possible.

In both cases, illustrate all WMUX and WDMUX components that are needed at the input and output stages as well as all connections between them.