# Course S-38.3165 (Switching Technology) exam questions, December 19, 2007

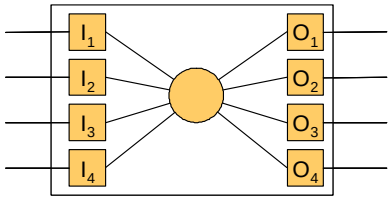
1. Answer the following questions.
   a.) What are the essential differences between circuit switching and packet switching?
   b.) What sort of a switching device is internally non-blocking?
   c.) In the Internet Protocol based networks, Classful Address scheme was replaced with Classless InterDomain Routing scheme. Why was this replacement done and what advantages were gained by this?

2. Switch fabric concepts.
   a.) How are logical depth and fan-out related to switch fabrics?
   b.) What property of a switch fabric is described by cost-index?
   c.) What sort of a switch fabric has full accessibility?

3. A router, which houses Fast Ethernet line-cards, is known to loose IP packets every now and then. Measurements have shown that the problem is in routing look-up process. Each line-card implements one Fast Ethernet interface, has a separate routing table, makes routing decisions by itself and the routing decision delay is known be 7.5 μs per packet.
   a.) What is the maximum IP packet routing capacity (given in packets/s) of each line-card guaranteeing that no packets are lost?
   b.) What is the maximum packet loss rate and at what circumstances is it faced?
   c.) What should be the routing table look-up speed (given in μs/packet) to avoid packet losses?

4. Show that in an *NxN* Clos network (where $N = pxq$) the number of cross-points
   a.) for a rearrangeable construction is $2\,p^2q + q^2p$
   b.) for a strictly non-blocking construction is $2p(2p - 1)\,q + q^2\,(2p - 1)$.

5. Optical switching.
   a.) Wavelength Routed Networks (WRN) networks have to fulfil two channel assignment constraints: wavelength continuity and distinct channel assignment. Explain what is meant by them.
   b.) If a 4x4 switching device (shown in the figure) is a ”broadcast star” type of a switch, how many wave lengths are needed to have full connectivity when WDM/ WDMA technique is applied? Show by a drawing all incoming and outgoing wavelengths (λ) and justify your answer.




   c.) If TDM/TDMA technique is applied, how many wavelengths are needed in the above 4x4 switching device? Show by a drawing all incoming and outgoing wavelengths (λ) and justify your answer.