Technical Realization of Communication Networks:
388031, Sept. 26, 2007

Question Al: Components for Networking Applications

1a) What technologies and semiconductor materials are used to manufacture integrated circuits for communications applications?
1b) How can integrated circuits be classified according to their flexibility and performance?
2a) How does a thermo-optic switch work?
2b) What are micro-electro-mechanical system (MEMS) switches?
2c) Why interferometric structures are used for optical switches?
3a) How the transmission windows of standard single-mode fiber are defined?
3b) Are there any new fiber types and what are the trends in optical communications?
4a) What are the main differences between a Fabry-Perot (FP) laser and a distributed feedback (DFB) laser?
4b) Which structures can be used to produce short optical pulses?
5a) Describe the main parameters and applications of optical filters.
5b) Which types of optical filters are used in communication networks?

Question A2: Interconnects and Systems

1a) Describe evolution of interconnection technologies during the last decades.
1b) Which types of interconnects do you know?
1c) In which way interconnects can be classified?
1d) Describe benefits and drawbacks of three typical interconnection solutiohs;
2a) What is Internet SCSI (iSCSI)?
2b) Describe encapsulation of storage data into TCP/IP packets by using the iSCSI protocol
3a) What are the main components of an InfiniBand subnet?
3b) Describe the functions of local (LID) and global (GID) identifiers?
4a) What are the main applications of the Common Switch Interface (CSIX)?
4b) Describe the main functions of the physical, interconnection, and logical/message CSIX levels.
4c) What is a CFrame?
5a) Describe SONET/SDH interfaces developed by the Optical Internetworking Forum (IOF).
5b) What are the main differences between System Packet Interface (SPI) and SERDES Frame Interface (SFI)?

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Question B1: Networking

What is the difference between

1) Isochronous, synchronous, and asynchronous connections?
2) Structure and operation of multi-stage connection networks within switching nodes for circuit-switching and those for multi-stage connection networks within high-performance routers?
3) The operation of soft-state routing tables and that of hard-state switching tables for circuit-switching?
4) Message switching, packet switching, frame switching, and cell switching?
5) Ring protection by wrapping and that by steering?

Question B2: Circuit-Switching

1) What is the fundamental difference in delay performance between a transmission tunnel and a packet embedding tunnel?
2) How are network elements synchronized in PDH, SDH, and OTN?
3) How are packet-switched systems mapped onto these transmission network systems?
4) How are traditional transmission systems, now used as access links, mapped onto current synchronous transmission network systems?
5) What are the packet transfer properties of packet flows over a circuit-switched tunnel?
6) What must be done to emulate circuit-switched flows over packet-switched networks?

Question B3: Packet-Switching

1) Which are the five transmission units that can be labeled in GMPLS?
2) How are options-included in the IPv4 header and how in the IPv6 header?
3) How many bytes has a ATM cell on the link and how many above the physical layer?
4) How are ATM cell-boundaries found?
5) Which are the two methods to assign labels in a LSP within MPLS?

Question B4: Wireless Access

1) Characterize the physical structure of the radio interface of GSM/GPRS.
2) What is the mechanism in GSM/GPRS to synchronize mobile stations with the base transceiver station?
3) Which physical structure is used in the DECT radio interface?
4) What are the properties of WiMax? What does the abbreviation mean?
5) Which timing structure is used in the access protocol of IEEE 802.11.
6) Give three categories of wireless media that requires a MAC.

Question B5: Wired Access

1) What is the difference between an CWDM and DWDM?
2) Which influence has CWDM on component requirements?
3) Which duplex mechanisms are used on a twisted copper-pair?
4) Give three categories of wired media that requires a MAC.