## Question B1: Networking

1. Explain quality-of-service (QoS), class-of-service (CoS) and grade-of-service (GoS). ✓
2. What are soft-state tables and how to operate hard-state tables? ✓
3. How to combine micro- and macro-mobility with respect to addressing? ✓
4. Which two basic security functions are required in wireless environments? ✓
5. What is the difference between routing protocols and forwarding protocols? ✓
6. Which two address-based data-forwarding schemes between end systems are used? ✓
7. Give all seven functional network planes with the cable/frequency-spectrum plane at the bottom. This is not the OSI layer model for protocols.
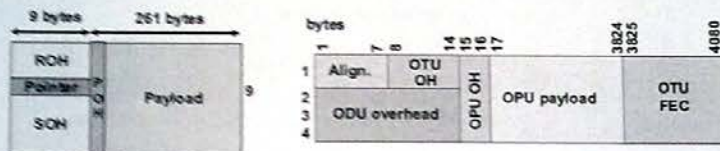
Question B2: Circuit-switching

1. What is the difference in operation of interleaved and concatenated SDH frames?
2. What does virtual concatenation mean in transmission switching?
3. Which procedure maps packets onto SDH transmission channels?
4. What are the synchronization differences in PDH, SDH, and OTH? ✓
5. What are the packet flow properties over a circuit-switched tunnel? ✓
6. What are the properties of transparent optical networks? ✓

Question B3: Packet-switching

1. How to address IEEE devices a) in IPv4, b) in IPv6? ✓
2. Which packet classes exist in Diffserv and how to control their forwarding?
3. Which four end-to-end transport protocols exist and give their main properties?
4. Which two basic addressing methods exist to transfer packets through the network? ✓
5. Which method above IP is required to notify the network to establish a connection? ✓
6. Give the four QoS categories and two examples of each of them.

Question B4: Wireless access

1. Give the difference between the transmission duplex mode in WLAN and WiMax.
2. Which two addressing levels must be considered in IEEE wireless mobility?
3. How are contiguous user data bits principally send over the radio interface?
4. Give three categories (not systems!) of wireless media that require a MAC. ✓
5. Which mechanism is used in WiMax to acknowledgment data transmissions?

Question B5: Wired access

1. Which transmission principle and which data formating structure is used in ADSL? ✓
2. What is the difference between an access link in PSTN and ISDN? ✓
3. Which duplex mechanisms can be used on a twisted copper-pair? ✓
4. What are the transmission characteristics of CWDM? ✓
5. Which differences exist been multimode optical fiber and POF communications? ✓
6. Which access technology uses the standard DOCSIS? ✓

- Please give short and readable answers.
- If not readable, the answer is wrong.
- List of subanswers is preferred over long and full sentences.
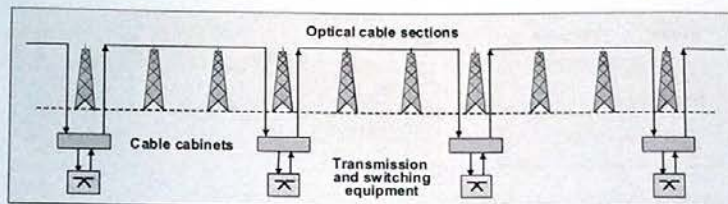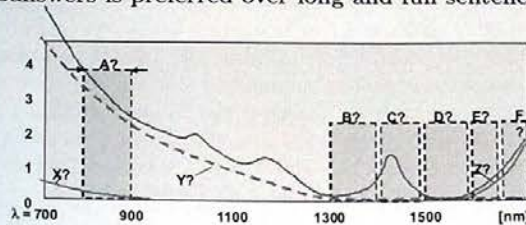
Question A1: Optical networking components

1. What types of optical fibers are used in optical communications? ✔
2. Which are the traditional three windows out of A to F? ✔
3. Give the advantage of usage for each of these three windows? ✔
4. Which three physical effects (X to Z) shape the attenuation curve of the fiber?
5. Give the structure of an fiber cable and how are fibers of buried cables accessed? ✔
6. Which nonlinear effects may occur in single-mode fibers? ✔

Question A2: Electronic networking components

1. Highlight differences between basic (binary) CAMs and ternary CAMs. ✔
2. Give the main system of static and dynamic random access memory. ✔
3. Give the functional layering of a typical SONET/SDH framer device.
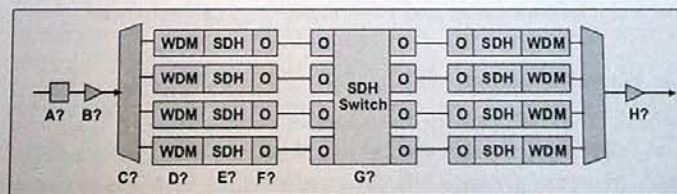
Question A3: Interconnects

1. Characterize components A to G of an WDM opague crossconnect.
2. Classify interconnects.
4. Characterize the interfaces of 40 Gigabit and 100 Gigabit Ethernet systems. ✔

Question A4: Systems

1. Give six different categories of network processor kernels. ✔
2. What are the main requirements on performance of network processors? ✔
3. Which technologies can be used to implement high-capacity backplanes? ✔