- **Please give short and readable answers.**
- **List of subanswers is preferred over long and full sentences.**

Question A1: Optical networking components

1) What types of fibers are used in optical communications?
2) How are the transmission windows of standard single-mode fiber defined?
3) What are the characteristics of the new fiber types?
4) How does an erbium-doped fiber amplifier (EDFA) operate?.
5) Which other optical amplifiers exist?

Question A2: Electronic networking components

1) What are the main trends in semiconductor electronics and ICs?
2) Which technologies and semiconductor materials are used in telecom ICs?
3) Describe at least three applications of content addressable memory (CAM).

Question A3: Interconnects

1) How interconnects can be classified?
2) What is HyperTransport (HT)?
3) Itemize the interfaces for 40 Gigabit and 100 Gigabit Ethernet systems.
4) Describe the SONET/SDH interfaces developed by IOF.

Question A4: systems

1) Which technologies can be used to implement SANs?
2) What components can be used in FC systems?
3) What is iSCSI?
4) Describe SONET/SDH interfaces developed by IOF.

Question B1: Networking

1) Give all the structural planes of telecommunication networks.
2) Which three traffic-oriented functions fulfil metro networks?
3) Which two technology-bypass methods permit deterministic packet delays?
4) Which two signaling protocol families exist in IP networks?
5) What is the difference between the service specifications QoS, CoS, and GoS?
6) How is network availability achieved in case of fiber or node failures?

Question B2: Circuit-switching

1) Which units can be labelled by GMPLS?
2) Which functionality does LCAS provide?
3) What does virtual concatenation mean in transmission switching?
4) What are the synchronization differences in PDH, SDH, and OTH?
5) Which kind of delays packets experience over ISDN end-to-end connections?
6) What are the characteristics of circuit-switching

Question B3: Packet-switching

1) What is inverse multiplexing and what is the term in Ethernet?
2) For which two purposes the HEC field in an ATM cell is used?
3) Which units are acknowledged in TCP?
4) What are the characteristics of packet-switching
5) What is the difference between a leaky-bucket and a token bucket?

Question B4: Wireless access

1) What are the characteristics of FDD and TDD in UMTS?
2) Which is the duplex mode of WLAN and DECT, respectively?
3) Explain why there exist four address fields in an IEEE 801.11 WLAN frame.
4) Which paging address scheme exists in GPRS?
5) How are mobile stations synchronized with a GSM/GPRS network?

Question B5: Wired access

1) Give the basic properties of a modem.
2) What are the transmission principle and data formating structure in ADSL?
3) Which access technology uses the standard DOCSIS?
4) What is the difference between an access link in PSTN and ISDN?
5) Describe the access mechanism on the ISDN bus for basic access.