

1. *Indicate whether the following statements are TRUE or FALSE (for each statement, correct answer: 1p, wrong answer: -1p, no answer: 0p):*

- a) Address resolution protocol (ARP) takes care of determining data link addresses.
- b) UDP is a connection oriented transport layer protocol.
- c) Collision detection (CD) strives to avoid hidden terminal problem.
- d) Frame relay applies virtual circuits.
- e) V.90 is a modem standard.
- f) The European 2 Mbit/s PDH system (E1) can carry 32 PCM signals.
- g) A pointer indicates the location of a "virtual container" within STM-1 frames.
- h) MSISDN numbers are also called signalling point codes (SPC).
- i) FDMA, TDMA and CDMA are multiple access methods.
- j) SCTP (stream control transmission protocol) is always used on top of UDP.

2. *Please answer the following questions using not more than 50 words per topic (subsequent words will be disregarded) and/or a figure: (5 p each)*

- a) What is the most important difference between TCP and UDP when QoS requirements of applications are concerned? Mention a typical application for both!
- b) In which layer does HDLC protocol work? Name its major functionalities.

3. *Please answer the following questions using not more than 50 words per topic (subsequent words will be disregarded) and/or a figure: (5 p each)*

- a) What are the OSI layers? Describe their tasks.
- b) Describe the function, realization and applications of Point Coordination Function (PCF).

4. *Please answer the following questions with not more than one sentence: (1 p each)*

- a) What does ISDN user part (ISUP) mean?
- b) Why must every ISUP message contain a 16-bit circuit identification code (CIC)?
- c) What does handover (US: handoff) mean in a cellular mobile network?
- d) Why is paging needed in a cellular mobile network?
- e) What are the basic tasks of the real time protocol (RTP)?
- f) What does classless interdomain routing (CIDR) mean?
- g) What does network address translation (NAT) mean?
- h) What is the main function of the domain name system (DNS)?
- i) Write a valid IPv4 address.
- j) Write a valid IPv6 address.

5. *Please answer the following questions using not more than 50 words per topic (subsequent words will be disregarded) and/or a figure: (2.5 p each)*

- a) Explain the basic idea of common channel signalling (CCS).
- b) Give 3 examples how a service control point (SCP) can affect the routing of a call.
- c) Explain the role of GMSC, HLR, and SMSC/VLR in a mobile terminated call (MTC).
- d) Explain why and how random access is used in a cellular mobile network.