HELSINKI UNIVERSITY OF TECHNOLOGY
Communications Laboratory
S-72.1130 Telecommunication Systems Exam 03.01.2007

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

T a) ATM applies fixed length packets.
F b) 802.11 Point Coordination Function takes care of contention services.
T c) 802.2 Logical Link Control (LLC) service "Unacknowledged Connectionless Service" does not apply error/flow control.
d) Diff Serv-principle follows hop-by-hop based routing.
T e) In round robin schemes, multiple nodes attempt to access medium statistically (as in 802.3).
F f) E1 (European 2 Mbit/s PDH system) offers 32 time slots for PCM signals.
F g) Channel associated signalling can be used for signalling to/from a database.
T h) The OSI transport layer (Layer 4) takes care of end-to-end flow and error control.
F i) Signalling point codes (SPC) are based on the ITU E.164 numbering scheme.
T j) STM-1 SDH systems can (generally) carry IP traffic.

2. ***Please answer the following questions using <u>not more than 50 words</u> per topic (subsequent words will be disregarded) and/or a figure: (2.5 p each)***
a) Discuss the differences of design philosophy of X.25 and Frame Relay.
b) Service sets of 802.11.
c) What is the Fast Sync Byte? What kind of functionalities it carries?
d) List the functions of Line Interface Circuit.

3. ***Please answer the following questions using <u>not more than 50 words</u> per topic (subsequent words will be disregarded) and/or a figure: (2.5 p each)***
a) List the physical level options of 802.11 standard.
b) Why guard interval is used in DMT?
c) What are the ways of ADSL to copes with the challenging local loop?
d) Summarize the development of mobile telecommunication networks in terminals, radio interface core network and in services.

4. ***Please answer the following questions: (5 p + 5 p)***
a) Explain the concepts handover, random access, paging, location updating, cell, and location area in a mobile network.
b) Explain the main signalling events taking place in the GSM network when setting up a mobile terminated call (MTC). The role and meaning of the following "items" should be described: GMSC, HLR, MSC/VLR, ISUP, and MAP (Mobile Application Part).

5. ***Please answer the following questions using <u>not more than 50 words</u> per topic (subsequent words will be disregarded) and/or a figure: (2.5 p each)***
a) Give 3 examples how the IPv4 address space can be "extended" (other than moving to IPv6).
b) Where, why, and how is RTP (Real Time Protocol) being used?
c) Explain the basic operation of SIP (Session Initiation Protocol).
d) What does MPLS (MultiProtocol Label Switching) mean? (How and why is MPLS used?)