HELSINKI UNIVERSITY OF TECHNOLOGY
Communications Laboratory

S-72.423 Telecommunication Systems

Examination Monday, 9.12.2002

Note: This is a closed-book examination, no lecture material is allowed to be present. You may answer in English, Finnish or Swedish (regarding questions 2 and 3).

1. Please answer true (T) or false (F) to the following questions (max. 10p). Correct answer gives 1 point, wrong answer gives -1 points, and unknown answer (U) yields 0 points. Therefore, please select (U) if you don't know the answer.

   F (a) The protocol Q.931 is used for link control in ISDN
   (b) Data and fax traffic cannot tolerate the compression performed in DCME (Digital Circuit Multiplexing Equipment) equipment
   T (c) G.711 specifies PCM (Pulse Coded Modulation) of voice frequencies
   F (d) DECT is based on FDD (Frequency Division Duplexing)
   (e) VOD (Video-on-Demand) is an application well suited to interleaving
   F (f) ATM cells can be carried over SDH connections
   T (g) ISUP can be used together with SCCP for handling end-to-end signalling
   (h) Dealing with high PAPR (peak-to-average power ratio) is a problem in design of CAP (Carrierless amplitude/Phase modulation) ADSL modems
   (i) UDP is a data protocol developed to deal with high-rate, good quality channels
   F (k) ATM transmission is always connection oriented

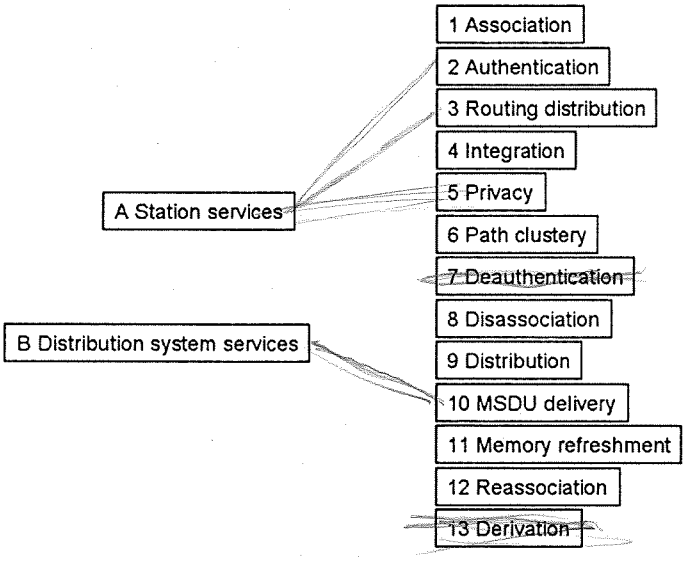
2. Please fill in the missing words (max. 10p):

   When in GSM a mobile terminal moves from one location area (LA) to another, a (a) location update must be performed. This is an example of a (b) mobility management procedure. Signalling system number 7 (SS7) is an example of a (c) common channel signalling system. The Signalling Connection Control Part (SCCP) can perform (d) global ? translation and is therefore very powerful. Dynamic allocation of IP addresses is necessary in case of (e) roaming or (f) 3G. A problem with IPv4 is (g) addresses. The Home Location Register (HLR) is not a router, it is a (h) database. In the Internet, a HTTP request is always sent from a (i) client to a (k) server.

3. Describe shortly (with a few sentences or a descriptive figure) the following concepts (max. 2p per concept, except 4p for d):
   a) Service Switching Point (SSP), Service Control Point (SCP) and Signalling Transfer Point (STP)
   b) PDP Context in GPRS
   c) User authentication in GSM
   d) Logical Link Control (LLC) services in 802.11 networks
      vuodellen lähetys radio kanavassa

S-72.423 Telecommunication Systems

4. The 802.11 standard defines services that provide the functions that the LLC layer requires for sending MAC Service Data Units (MSDUs) between two entities on the network. These services, which MAC layer implements, fall into two categories: Station services and Distribution system services. In the figure below, connect by lines what is included to these services! (Some boxes might be left without lines.)



5. Assign each protocol at the left <u>one and only one</u> of the tasks at the right (for example protocol ABC can perform task 4, protocol XYZ can perform task 2 ...)

ISUP	The protocol at the left ...
AAL 2	1 ... can route information through the network
UDP	2 ... contains signalling messages for setting up a speech connection
IPv4	3 ... supports end-to-end flow control
AAL 5	4 ... performs some kind of error control
SIP	5 ... can perform segmentation and reassembly of higher layer data
ATM layer	6 ... can perform multiplexing of higher layer data
TCP	7 ... can perform none of the tasks mentioned above
MTP	
IPv6	