INTERNET MULTIMEDIA   06.06.2003

1. Brief questions (2 pt each, total 10 pt).
a. One would imagine that on average, a silence detector would reduce the bandwidth of packet-switched telephone conversation to half of a circuit-switched conversation. Name at least two reasons why the efficiency is typically not quite as good as that.
b. The IPv4 header is 20 bytes long. The IPv6 header is 40 bytes long, while the address size has quadrupled. What functionality has disappeared from the fixed header?
c. Chaining and redirection are concepts found in a number of Internet protocols. What mechanisms does HTTP offer to implement these?
d. What are the components of delay in a WFQ system, besides the propagation delay determined by the speed of light? You don't have to know their quantitative value, just explain intuitively what they are caused by and what they depend on.
e. The minimal audible difference in loudness is 3 dB. What power ratio (or ratio in air pressure) does this correspond to?

2. Liisa is connected to the Internet via a 28.8 kb/s modem and wants to participate in an audio conference with Raimo, Erkki and Hannu. The three men are talking (usually being polite) at 20 kb/s codec using RTP. Liisa's ISP is offering her to connect to the conference through either a translator or a mixer. The translator converts the audio to a 10 kb/s codec. Explain the trade-offs between the two choices. (5 pt)

3. You are asked to provide seating for the students waiting in the Student Information Center. Assume that students arrive at a rate of one student every minute and that it takes the clerk 40 seconds to serve them, with students arriving as a Poisson process and requiring exponentially distributed service time. On average, how many students are waiting in line and how long does a student have to wait? (5 pt)

4. Imagine that a wireless network was installed on the Linnanmaa campus. It is also used to distribute radio programs on campus. The radio program uses RTP over UDP. Describe briefly (using diagrams of packet flows and network entities) how you might use SIP to make sure that the "radio" reception is continuous. Please describe the solution and possible problems that may be involved. Is there another design approach for this application? (5 pt)

5. Instead of transmitting music via analog FM radio, we want to send MP3's, digitally modulated, across the same radio band. Assume that we need an SNR of 10 dB and that each channel is 200 kHz wide. How many MP3 streams can we squeeze into one FM station? (5 pt)