

Please write readably and answer in English.

There are three classes of questions: (a) expecting (relatively) short answers, (b) expecting more elaborate answers, and (c) a small design task. The questions are marked accordingly.

Questions:

1. [6p, b] a) Which functions do RTCP sender and receiver reports provide?  
b) How can information in the RTCP receiver report be used for congestion control?  
c) Where are the limits for congestion control?
2. [6p, b] a) Outline the operation of the SDP offer/answer model.  
b) Assume you receive an offer containing the following SDP fragment. Briefly explain what it says. How do you respond if you support GSM and PCMU voice?

```
m=audio 60002 RTP/AVP 0 99 100
a=rtpmap:0 PCMU/8000
a=rtpmap:99 GSM/8000
a=rtpmap:100 L16/44100
m=video 50001 RTP/AVP 31
a=rtpmap:31 H261/90000
```

3. [6p, a] What is an RTSP SETUP message used for?
4. [6p, b] a) Outline the operation of SIP digest authentication.  
b) How can an endpoint ascertain the identity of the SIP service provider in this context?
5. [6p, a] What is a SIP focus and what is a SIP conference factory URI? How are they related?
6. [6p, a] Explain the difference between Record-Route and Via for SIP message forwarding.
7. [6p, a] Briefly sketch two broadcasting schemes (no return channel) that allow users better access to media streams than traditional TV. What are their pros and cons with respect to each other? What are their respective demands on the receiver system?
8. [12p, c] You want to design a home media center which works like a Digital Video Recorder (DVR). The DVR has access to an Electronic Program Guide (EPG, the meta data format is known to you) for all the available channels and you are able to bookmark the programs you are interested in. The channels are broadcast using IPTV (multicast RTP) and your DVR is able to select and record the channel. Multiple devices at your home should be able to connect to your media server.
  - (a) What are the considerations for using HTTP or RTSP for streaming the recorded video in your home network? Which one would you prefer?
  - (b) What components are needed to realize your design? Where are they located?
  - (c) How would you realize control and media distribution from the DVR.

*(Note: there are many possible solutions).*