

Please write readably and 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, a] Which functions does RTCP provide?
2. [6p, b] Sketch the calculation algorithm of the RTCP transmission interval in basic RTP.
3. [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 want to use only GSM 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
```

4. [6p, b] Your RTSP server receives the following RTSP message.

```
PLAY rtsp://server.example.org/movies/1-2-3 RTSP/1.0
CSeq: 42
Session: 12
Transport: RTP/AVP;unicast;client_port=4588-4589;server_port=6256-6257
```

- a) What are the semantics of this message?
 - b) Which request(s) has the client sent before?
Which information would the positive(!) server's response to this message contain?
5. [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?
 6. [6p, a] What (three) different semantics can be associated with a SIP URI? Give an example each.
 7. [6p, a] What are the differences between a SIP proxy server and a SIP redirect server.
 8. [6p, a] What is a self-signed certificate? Which protection does it offer? Which not?
 9. [6p, a] Describe how QoS reservations (e.g., using RSVP) can be coupled with SIP call signaling to ensure proper audio quality during a call.
 10. [6p, b] What is the purpose of TURN? Outline its operation.
 11. [6p, c] Assume user A is watching an IP-based based television program using an RTSP-capable interactive TV set and finds an interesting piece of documentation A wants to point B to. A wants to call B (using SIP) and inform B about the program and discuss its contents while watching each in their home. Sketch the protocol interactions for one possible solution (there are many!) and describe how it works and why you have chosen your approach.