

Please write readably.

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 basic two options for error repair do you have? What are their tradeoffs?
2. [6p, a] Which options for limiting resource consumption in the network are available to a protocol designer? Sketch one approach with and one without network support.
3. [6p, a] Discuss two aspects of scalability and describe for both how scalability can be achieved.
4. [6p, a] Discuss the differences between conformance and interoperability. Why aren't the two the same thing? Where do you see the two intersect?
5. [6p, a] Using multicast makes data confidentiality harder than it is with a unicast protocol. Why?
6. [6p, b] "Make or take" decisions are often an important design alternative in protocol design. Discuss two reasons in favor of each choice. Give one example for a protocol aspect where a *make* decision is a good idea and one example where a *take* decision is preferred; in each case, briefly explain why.
7. [6p, b] (a) Describe by example how a Network Address Translator (NAT) may interfere with an application protocol.  
(b) Discuss two alternatives how to address the issue identified in (a). Which is the better one and why?
8. [12p, c] "In protocol design, perfection has been reached not when there is nothing left to add, but when there is nothing left to take away." (RFC1925)

Propose removing three elements of the TCP protocol and, for each one, explain one of

- 1) how the functionality could be provided using other TCP protocol elements
- 2) why the now missing functionality does not really matter that much
- 3) how the functionality removed could be reasonably achieved at other layers in today's TCP applications without changing the fundamental design of the Internet.

As a reminder, below is the TCP header:

