Pearls of Computer Science (201700139/201700149)

October 12, 2018 test

Answers

1. Operating Systems

5 pt (a) A.

5 pt (b) B.

5 pt (c) C.

Many chose D, but that's not right: swapping allows each process to use (almost) all of the computer's memory, by removing the other processes' data from memory by temporarily storing it on the hard disk. Fairly sharing would mean each process gets the same fraction of the memory (e.g., 4 processes each getting one quarter of the memory).

5 pt (d) B.

This was discussed and studied in the practical work.
Many chose option A; metadata indeed also needs to be stored, but for this separate harddisk blocks are used; in fact, a single block of 4096 bytes is enough to contain the metadata for many files.

5 pt (e) D.

5 pt (f) D.

2. Networks - protocols

5 pt (a) C.

In this case, packets 1, 2, 4, and 6 belong to one connection, and packets 3, 5 and 7 to the other. Note that e.g. packet 1 and 4 belong together but go in opposite directions, so source and destination are interchanged.

5 pt (b) C.

This packet only acknowledges earlier data (namely packet nr. 4), but contains no new data (it has Len=0), so there's no need to send an acknowledgement for it (otherwise, we would keep sending acknowledgements for acknowledgements without every stopping).)

10 pt (c) F; Seq=2001, Ack=1130.

Many chose option B. Packet 7 indeed is a retransmission (of packet 3), but still an acknowledgement must be sent. If no acknowledgement is sent for the retransmission, the other side will probably retransmit it again, and again, and again, since it apparently didn't receive the original acknowledgement (that's packet nr. 5) that was sent for the original packet nr. 3.

5 pt (d) C.

The purpose of the network layer is to deliver packets world-wide (though without delivery guarantee, so packets may be lost). For this, a unique way of addressing every host in the world is needed.

5 pt (e) C.

Thanks to the systematic assignment of addresses, a single entry in a forwarding table can suffice for many destinations: e.g., "all packets for 130.89.0.0 ... 130.89.255.255 must be sent towards the UT". If addresses were assigned randomly, every router in the world would need separate entries for every computer in the UT network.

5 pt (f) B.

Many chose D here, but that is wrong: web traffic uses port 80 on the server, but some other (random) port on the client. So in each packet port 80 is *either* the source *or* the destination port, but not both.

3. Networks - delay

13 pt (a) The transmission delays are 2, 1, and 4 ms, respectively (packet length divided by transmission speed (bits/s)).
The propagation delays are negligible, 12 ms, and negligible (distance divided by signal propagation speed (m/s)).

10 pt (b) Adding all transmission and propagation delays gives 19 ms; no queueing for the first packet.

6 pt (c) The second packet will have to wait (queue) at host A for 2 ms until the transmission of the first packet finishes. Then 2 ms of transmission delay, no queueing at B (because B's outgoing link is faster, so B has already finished transmitting the first packet by the time the second packet arrives), 1 ms of transmission delay at B, and 12 ms of propagation delay. Total: 17 ms.

6 pt (d) The first packet arrived at node C at time 2+1+12=15 ms, and then has 4 ms of transmission delay. The second packet arrives there at t=17 ms, so still has to wait 2 ms (queueing delay) until its transmission can start, which takes another 4 ms. Total 23 ms.