Network Systems (201300179/201400431), Test 2

March 6, 2015, 08:45–10:15

Brief answers

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1. Physical media and encoding

3 pt (a)

Longer glass fiber means more signal attenuation/absorption, so lower S/N.
Longer glass fiber means more dispersion (difference of path length between straight and "bouncy" path), so pulses need to be farther apart to prevent overlap, so fewer pulses per second. In terms of the capacity formula, the signal bandwidth decreases.

Some frequently made errors are saying that light escapes into the cladding at every bounce (it doesn't, thanks to the total reflection phenomenon), and saying that more noise gets into the fiber (no, such noise would be in the form of light from the outside, but it's pretty easy to stop light from getting in by just covering it in some opaque material; this is different in electrical cables, which are quite hard to shield really effectively).

2 pt (b)

Prevent long sequences of zeros or ones, which in turn would cause problems with clock recovery or baseline wander.

3 pt (c)

Any table mapping all 8 3-bit patterns to 8 of the 9 possible 2-"trit" patterns is correct.
Such a table will not achieve the goal from the previous question, because out of the 9 2T-patterns, 3 have constant level, so you'll need to use at least 2 of them.

Unfortunately, several students forgot to reply to the latter subquestion.

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2. Medium access

2 pt (a)

Category (ii); they can hear each other, but not while transmitting, because a node's own transmit signal is so strong at its own antenna, that it overpowers everything received from others.

Quite a few student thought it was (i) because most WiFi communication is with an access point, not among the mobile nodes. However, for the purpose of the medium access mechanism, it's still the case that the nodes can hear each other (except in cases where the hidden terminal problem occurs), and this is in fact used by WiFi's CSMA/CA algorithm.

2 pt (b)

Yes, it can, because ALOHA does not require hearing anything. It's not a good choice though, because one could improve efficiency by using an algorithm that does not allow transmission as long as one hears another station still transmitting.

Many students seem to think that ALOHA needs category (iii) to detect collisions. That's not true: if the nodes technically can detect collisions *while* they are transmitting, then why should they continue transitting during a collision? The whole point of ALOHA is that the nodes don't hear each other; they just randomly transmit, at

good luck.
Of course, they do need to retransmit if a collision has happened, but they don't need to detect the collision *while* it happens; they could find it out later, e.g., by not getting an acknowledgement.

2 pt (c)

No, it can't, because the "Collision Detect" part requires being able to hear other nodes transmitting during one's own transmission.

Unfortunately, several misread the question, reading CSMA/CA instead of CSMA/CD. Please read carefully!

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3. (Inter)Networking

2 pt (a)

Yes, on same link same value, since the VCI value identifies to which circuit they belong.
No, on different links in general different values, since the values have local significance.

2 pt (b)

IP addresses are needed because of their hierarchical assignment, keeping the size of forwarding tables down.

4 pt (c)

First 2 fragments form a packet with data "CDEABCD".
Next 2 fragments don't form a complete packet, there's a fragment missing, so will be discarded.
Next single fragment is also not completed, and thus discarded. Note that it is not the missing part of the previous packet, since it's from a different source.
Next single fragment is not even meant for this host, so discarded.
Third 2 fragments form a packet with data "GHIJKLMNO". (Note that these fragments have some overlap, which is a rather unlikely thing to happen in reality.)

Many students combined fragments which have the same identifier value but different source addresses. That's not correct. How could those fragments ever have been part of a single packet, if they don't come from the same source?

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4. Routing and flooding

4 pt (a)

Step	Confirmed	Tentative
1	(D, 0, –)	(B, 2, B)
2	(D, 0, –) (B, 2, B)	(A, 7, B) (C, 3, B)
3	(D, 0, –) (B, 2, B) (C, 3, B)	(A, 6, B)
4	(D, 0, –) (B, 2, B) (C, 3, B) (A, 6, B)	

2 pt (b)

Each LSA has a sequence number, and each router only repeats the LSA if it has a newer sequence number than seen before.

3 pt (c)

The LSA algorithm may deliver the same packet multiple times: because a router may get it from several neighbours who haven't seen the packet before. Bridges use the spanning tree, which removes all loops, and gives each LAN a unique path to the root, so each flooded packet reaches each LAN exactly once.

End of this exam.