Quiz 5

Write your name on the exam. Write something for every question. Students who do not write something for everything lose out over students who write down wild guesses. You will get some points if you attempt a solution but nothing for a blank sheet of paper. Write something down, even wild guesses. Problems take long to read but can be answered concisely.

Question	Maximum	Score
1	8	
2	12	
Total	20	

Question 1 – various short questions

Explain concisely the difference between the following pairs of terms

a) What are the sizes of the Ethernet and IP addresses?

The Ethernet address has 48 bits (6 bytes), the IP address has 32 bits (4 bytes).

b) What is the role of ARP?

The role of ARP is to allow computers on a LAN to find the MAC address of the computer with a given IP address. ARP uses data link layer broadcast frames requesting the destination to give its MAC address. Answers are cached in a local lookup table.

c) What are the benefits of VLANs?

Compared to using a single LAN, VLANs have security and performance benefits (some computers cannot talk to each other and respectively broadcast traffic is reduced). Compared to using separate LANs covering the same computers, VLANs are cheaper (and easier to administer) because they can be implemented with fewer devices and fewer wires.

d) How does the sender of an IP packet decide whether the destination is on the same LAN or not?

If the destination has the same network address, it is on the same LAN. The (length of) the netmask establishes how many of the first bits of the computer's address define the network address.

Question 2 – Medium access control

a) Why does Ethernet use a *random* backoff time?

So that the two senders involved in a collision do not re-send at the same time causing perpetual collisions.

b) Why does Ethernet use *exponential* backoff?

So that senders can quickly adapt to the network conditions. When the number of active senders is small, a small backoff time is better as the senders don't wait unnecessarily. When their number is large, a large backoff time is better as it avoids reduces the chance of many repeated collisions for the same frames.

c) What is carrier sense and why does it work better for wired LANs, than for wireless LANs?

Carrier sense: before sending, a sender listens to the medium, and if it detects another sender's transmission, it does not send (to avoid causing a collision). For wired LANs, each computer connected to the wire can detect every other computer's transmission, for wireless LANs it can happen that two senders cannot detect each other's signal, but the receiver hears both.

d) Define what a "collision domain" is in an extended LAN using Ethernet switches/bridges as well as hubs/repeaters?

A "collision domain" is a maximal portion of the switched Ethernet network so that no two computers within that portion of the network can send at the same time. Hubs/repeaters do not separate the wires they connect into different collision domains while switches/bridges do.