Homework #3

1. What is circuit switching, and what are its chief characteristics? (4 pts)

Circuit switching refers to a communication mechanism that establishes a path between a sender and receiver with guaranteed isolation from paths used by other pairs of senders and receivers. Point to point communication (communication between exactly to endpoints). Separate steps for circuit creation, use, and termination (distinguishes circuits that are switched). Also, performance equivalent to an isolated physical path; communication between two parties is not affected by other communications and circuit switching must provide the illusion of an isolated path for each pair of communication entities.

2. In a packet switching system, how does a sender transfer a large file? (3 pts)

 In packet switching a sender is to divide each message into blocks of data that are known as packets; the size varies and the packet switching technology defines maximum packet size.

3. Define unicast, multicast, and broadcast addresses. Explain the meaning of each (3 pts)

 Unicast identifies a single computer and specifies that only the identified computer should receive a copy of the packet.

Broadcast corresponds to all computers and specifies that each computer on the network should receive a copy of the packet.

Multicast identifies a subset of the computers on a given network and each computer in the subset should receive a copy.

4. Why is byte stuffing needed? (4 pts)

 Byte stuffing is needed to distinguish between data and control information, such as frame delimiters. Sender changes a data to replace each control byte with a sequence. The receiver replaces the sequence with the original one. As a result, a frame can transfer arbitrary data and the underlying system never confuses data with control information.

5. Explain the three basic approaches used to arbitrate access to a shared medium. (3 pts)

Channelization protocols this refers to a mapping between a given communication and a channel in the underlying system. Engage in a distributed algorithm for controlled access that provides a distributed version of statistical multiplexing, polling, reservation and token passing. They can use a random access strategy because access only occurs when a given station has a packet to send.

6. In the Aloha protocol, what happens if two stations attempt simultaneous transmission on the inbound frequency, and how is the problem handled?  (4 pts)

 If two stations simultaneously transmit the signals will interfere and the two transmissions will be garbled called a collision and say that the two transmitted packets collide. The protocol handles the collision by requiring a sender to retransmit each lost packet.

7. What is binary exponential backoff? (4 pts)

 Binary exponential backoff occurs after a collision occurs and it doubles the range of the random delay after each collision. After the collision a computer must wait for the cable to become idle again before transmitting a frame.

8. Expand the acronym CSMA/CD, and explain each part (4 pts)

 Carrier Sense Multi-Access with Collision Detection collision. A computer must wait for the cable to become idle again before transmitting a frame. Randomization is used to avoid having multiple stations transmit simultaneously as soon as the cable is idle. The standard specifies a maximum delay “d” and requires each station to choose a random delay less than “d” after a collision occurs.

9. Why is CSMA/CA needed in a wireless network? (2 pts)

 The problem is sometimes called the hidden station problem because some stations are not visible to others. The csma/ca triggers a brief transmission from the intended receiver before transmitting a packet. The idea is that if both the sender and the receiver transmit a message all computers within range of either will know a packet transmission is beginning.

10. How large is the maximum Ethernet frame, including the CRC? (3 pts)

 1518 bytes, header d address 6 bytes, source address 6 bytes, type 2 byte, CRC 4 byte and 1500 bytes of payload

11. An 802.11 header contains two destination addresses. Explain the purpose of each. (4 pts)

The purpose of both destination addresses is to coordinate Access points, that way access points can provide a seamless mobility similar to cellular phone system. Some designs measured signal strength and attempted to move to a wireless node to a new AP. This occurs, when the signal received at the new AP exceeded the signal strength at the new existing AP.

12. What are SIFS and DIFS, and why are they needed?  (4 pts)

SIFS defines how long a receiving station waits before sending ACK or other response.

DIFS defines how long a channel must be idle before a station can attempt transmission, which is equal to SIFS + two slot times (10 sec + 20 sec + 20 sec). CSMA/CA requires a pair to exchange Ready To Send and Clear To Send messages before transmitting packet. Wi-fi networks do not employ collision detection, a sender waits for an acknowledgement message. If not ACK arrives, the sender assumes the transmission was lost.

13. Explain the store and forward paradigm. (3 pts)

To perform store and forward processing a packet switch buffers packets in memory. The store operation occurs when a packet arrives; I/O hardware in the switch places a copy of the packet in memory. The forward operation occurs once a packet has arrived and is waiting in memory. The Processor examines the packet determines its destination and sends the packet over the I/O interface that leads to the destination.

14. What are the two conceptual parts of a WAN address? (2 pts)

 Hierarchical addressing divides each address into two parts, site and computer at the site. The first part identifies a packet switch and the second part identifies a specific computer.

15. What benefit does dynamic routing offer? (2 pts)

The benefit of dynamic routing is that the routes change as conditions on the network change.

16. What are the two basic approaches used to perform a distributed route computation, and how does each work?  (4 pts)

Link-State Routing (LSR), which uses Dijkstra’s algorithm. This algorithm finds the shortest Path first routing. Packet switches periodically send messages across the network that carry the status of a link. Every switch collects incoming status messages and uses them to build a graph of the network. Then, each switch uses an algorithm to produce a forwarding table by choosing itself as the source. It will also broadcast a status message that the link is down. The switches receive the broadcast and reconstruct the table.

Distance0Vector Routing (DVR), which uses another approach. In DVR, a switch sends a complete list of the destinations and the current cost of reaching each. DVR message are not broadcast, it only sends a DVR message to its neighbors. Each message contains destination and distance. Each packet switch must keep a list of possible destinations. When a message arrives at a switch from neighbor N at a switch from neighbor N, the switch examines each item in the message and changes its forwarding table if the neighbor has a shorter path to some destination than the path currently being used.