**Sheet for 138 final**

3. **R14**. True or false?

**a.** Host A is sending Host B a large file over a TCP connection. Assume

Host B has no data to send Host A. Host B will not send acknowledgments

to Host A because Host B cannot piggyback the acknowledgments

on data.

**b**. The size of the TCP rwnd never changes throughout the duration of the

connection.

**c.** Suppose Host A is sending Host B a large file over a TCP connection. The

number of unacknowledged bytes that A sends cannot exceed the size of

the receive buffer.

d. Suppose Host A is sending a large file to Host B over a TCP connection. If

the sequence number for a segment of this connection is *m*, then the

sequence number for the subsequent segment will necessarily be *m* + 1.

e. The TCP segment has a field in its header for rwnd.

f. Suppose that the last SampleRTT in a TCP connection is equal to 1 sec.

The current value of TimeoutInterval for the connection will necessarily

be ≥ 1 sec.

g. Suppose Host A sends one segment with sequence number 38 and 4 bytes

of data over a TCP connection to Host B. In this same segment the

acknowledgment number is necessarily

a) false b) false c) true d) false e) true f) false g) false

3.R15 Suppose Host A sends two TCP segments back to back to Host B over a TCP

connection. The first segment has sequence number 90; the second has

sequence number 110.

a. How much data is in the first segment?

b. Suppose that the first segment is lost but the second segment arrives at B.

In the acknowledgment that Host B sends to Host A, what will be the

acknowledgment number?

a) 20 bytes b) ack number = 90 3.

P27

a) In the second segment from Host A to B, the sequence number is 207, source port number is 302 and destination port number is 80.

b) If the first segment arrives before the second, in the acknowledgement of the first arriving segment, the acknowledgement number is 207, the source port number is 80 and the destination port number is 302.

c) If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, the acknowledgement number is 127, indicating that it is still waiting for bytes 127 and onwards.

4. R3. What is the difference between routing and forwarding?

* Forwarding is about moving a packet from a router’s input port to the appropriate output port. Routing is about determining the end-to-routes between sources and destinations

**4.R8** Three types of switching fabrics are discussed in Section 4.3. List and briefly

describe each type. Which, if any, can send multiple packets across the fabricin parallel?

* Switching via memory; switching via a bus; switching via an interconnection network. An interconnection network can forward packets in parallel as long as all the packets are being forwarded to different output ports

4.R12. Do routers have IP addresses? If so, how many?

Yes. They have one address for each interface

4.R16. Suppose an application generates chunks of 40 bytes of data every 20 msec,and each chunk gets encapsulated in a TCP segment and then an IP datagram.What percentage of each datagram will be overhead, and what percentage will be application data?

* 50% overhead

4. P7. Suppose two packets arrive to two different input ports of a router at exactly

the same time. Also suppose there are no other packets anywhere in the

router.

a. Suppose the two packets are to be forwarded to two *different* output ports.

Is it possible to forward the two packets through the switch fabric at the

same time when the fabric uses a *shared bus*?

* no

b. Suppose the two packets are to be forwarded to two *different* output ports.

Is it possible to forward the two packets through the switch fabric at the

same time when the fabric uses a *crossbar*?

* Yes, as long as the two packets use different input busses and different output busses, they can be forwarded in parallel.

c. Suppose the two packets are to be forwarded to the *same* output port. Is it

possible to forward the two packets through the switch fabric at the same time when the fabric uses a *crossbar*?

* No, in this case the two packets would have to be sent over the same output bus at the same time, which is not possible.

4. P19. Consider sending a 2400-byte datagram into a link that has an MTU of

700 bytes. Suppose the original datagram is stamped with the identification

number 422. How many fragments are generated? What are the

values in the various fields in the IP datagram(s) generated related to fragmentation?

* 2400-20/680( 20 bytes in an ip header) =4 packets, 422 Each fragment will have Identification number 422. Each fragment except the last one will be of size 700 bytes (including IP header). The last datagram will be of size 360 bytes (including IP header). The offsets of the 4 fragments will be 0, 85, 170, 255. Each of the first 3 fragments will have flag=1; the last fragment will have flag=0

4.22. Suppose that the ISP instead

assigns the router the address 24.34.112.235 and that the network address of

the home network is 192.168.1/24.

1. Assign addresses to all interfaces in the home network.

Home addresses: 192.168.1.1, 192.168.1.2, 192.168.1.3 with the router interface being 192.168.1.4

b. Suppose each host has two ongoing TCP connections, all to port 80 at

host 128.119.40.86. Provide the six corresponding entries in the NAT

translation table.

WAN Side LAN Side

24.34.112.235, 4000 192.168.1.1, 3345 /24.34.112.235, 4001 192.168.1.1, 3346

24.34.112.235, 4002 192.168.1.2, 3445 /24.34.112.235, 4003 192.168.1.2, 3446

24.34.112.235, 4004 192.168.1.3, 3545 /24.34.112.235, 4005 192.168.1.3, 3546

5.R3. What are some of the possible services that a link-layer protocol can offer to

the network layer? Which of these link-layer services have corresponding

services in IP? In TCP?

Framing: there is also framing in IP and TCP; link access; reliable delivery: there is also reliable delivery in TCP; flow control: there is also flow control in TCP; error detection: there is also error detection in IP and TCP; error correction; full duplex: TCP is also full duplex.

5.R9. How big is the MAC address space? The IPv4 address space? The IPv6

address space?

2^48 MAC addresses; 2^32 IPv4 addresses; 2^128 IPv6 addresses.

5.R10. Suppose nodes A, B, and C each attach to the same broadcast LAN (through their adapters). If A sends thousands of IP datagrams to B with each encapsulating frame addressed to the MAC address of B, will C’s adapter processthese frames? If so, will C’s adapter pass the IP datagrams in these frames to the network layer C? How would your answers change if A sends frames with the MAC broadcast address?

C’s adapter will process the frames, but the adapter will not pass the datagrams up the protocol stack. If the LAN broadcast address is used, then C’s adapter will both process the frames and pass the datagrams up the protocol stack.

5.R11. Why is an ARP query sent within a broadcast frame? Why is an ARP

response sent within a frame with a specific destination MAC address?

An ARP query is sent in a broadcast frame because the querying host does not which adapter address corresponds to the IP address in question. For the response, the sending node knows the adapter address to which the response should be sent, so there is no need to send a broadcast frame (which would have to be processed by all the other nodes on the LAN).

5.P1.Suppose the information content of a packet is the bit pattern 1110 0110 1001 1101 and an even parity scheme is being used. What would the value of the field containing the parity bits be for the case of a two-dimensional parity

scheme? Your answer should be such that a minimum-length checksum field

is used.

1 1 1 0 1 0 1 1 0 0 1 0 0 1 0 1 1 0 1 1 1 1 0 0 0

5.P5. Consider the 7-bit generator, G=10011, and suppose that D has the value 1010101010. What is the value of R?

If we divide 10011 into 1010101010 0000, we get 1011011100, with a remainder of R=0100. Note that, G=10011 is CRC-4-ITU standard.

6.R1. What does it mean for a wireless network to be operating in “infrastructure

mode?” If the network is not in infrastructure mode, what mode of operation is it in, and what is the difference between that mode of operation and infrastructuremode?

In infrastructure mode of operation, each wireless host is connected to the larger network via a base station (access point). If not operating in infrastructure mode, a network operates in ad-hoc mode. In ad-hoc mode, wireless hosts have no infrastructure with which to connect. In the absence of such infrastructure, the hosts themselves must provide for services such as routing, address assignment, DNS-like name translation, and more.

6.R4. As a mobile node gets farther and farther away from a base station, what are

two actions that a base station could take to ensure that the loss probability of

a transmitted frame does not increase?

a) Increasing the transmission power b) Reducing the transmission rate

6.R5. Describe the role of the beacon frames in 802.11.

APs transmit beacon frames. An AP’s beacon frames will be transmitted over one of the 11 channels. The beacon frames permit nearby wireless stations to discover and identify the AP.

6. R16. If a node has a wireless connection to the Internet, does that node have to be

mobile? Explain. Suppose that a user with a laptop walks around her house

with her laptop, and always accesses the Internet through the same access

point. Is this user mobile from a network standpoint? Explain.

No. A node can remain connected to the same access point throughout its connection to the Internet (hence, not be mobile). A mobile node is the one that changes its point of attachment into the network over time. Since the user is always accessing the Internet through the same access point, she is not mobile.

6. R17. What is the difference between a permanent address and a care-of address? Who assigns a care-of address?

A permanent address for a mobile node is its IP address when it is at its home network. A care-of-address is the one its gets when it is visiting a foreign network. The COA is assigned by the foreign agent (which can be the edge router in the foreign network or the mobile node itself).

15. Assuming that data D = 1110110, G = 1001, degree of G r = 3, use CRC algorithm to determine R (Remainder) which is the CRC bits for D, the data to be sent. CRC bits = 001

16 The IPv4 header checksum only verifies the integrity of IP header and not the data field because (a) the packet is forwarded according to the header information (b) the delivery of the data at the destination to the higher layers requires accurate header information. (c) Some applications can tolerate some data errors d) All of the above D

20. An IP address, 00011111 00001001 00000011 10001000 in a subnet of size 128. What is the subnet part of IP address in the format of a.b.c.d/x, using CIDR addressing 31.9.3.128/25

21. In CRC a polynomial expression for G = 1111 can be written as x 3 + x2 + x + 1 22. Which of the following about mobile systems is/are true? a. When a mobile device is in a foreign (visited ) network it is typically contacted by a correspondent directly without going through its home network. b. a correspondent wanting to communicate with a roaming mobile device first obtains the roaming device’s foreign address (IP address or phone number) by direct communication with it over a special channel. Then it sends its message using the roaming device’s foreign (visited) address (IP Address or phone number c. a correspondent wanting to communicate with a roaming mobile device sends its message using the roaming device’s permanent address (IP Address or phone number); the message is intercepted by the home agent, and delivered to the roaming device via foreign agent d. None of above C

23. Which of the following service is performed by all three protocols: TCP, IP and Ethernet Link a. Connection establishment and termination b. Error detection c. Flow control d. Congestion control B

24. Which of the following is true of parity checking? a. Both odd and even parity detect 100% of errors b. Odd parity detects even number of errors whereas even parity detects odd number of errors c. Both odd and even parity detect odd number of errors d. None of the Above C

25. Suppose the information content of a packet consists of the bit pattern 1111 1110 1100 1000 and an even parity scheme is used. What will be the 5-bit value of the parity bits assuming twodimensional parity? 01010

26. Which of the following about IP is false? a. IPv6 address has 128 bits whereas IPv4 address uses 32 bits. b. Host is the only one which performs fragmentation in both IPv4 and IPv6 c. Host performs reassembly in both IPv4 and IPv6 d. IPv6 routers are designed to focus on routing rather than dealing with non-routing issues such as error-checking and fragmentation. e. none of above B