CANNOT use a search engine of any kind or information sources like wikipedia or any other outside information source.

3. You are NOT permitted to use any other application other than a browser to access the exam and zoom for invigilation purposes. A PDF reader is okay or software to read notes.

4. You are NOT permitted to receive any help other than that provided by the instructor or TA for the course.

You are REQUIRED to agree to these exam rules to participate in the exam and to receive a mark.

Please signify your agreement with the above statement by choosing the appropriate option from the drop down menu below.

[agree]

Correct!

agree

orrect Answers

agree

I agree

Agree

I agree.

Question 2

9 / 10 pts

Match the statement on the left with whether it is true or false.

Correct!

A NAT device always rewrites the source IP address and source port of and IP datagram and TCP segment. — FALSE

Correct!

Xor(Xor(Xor(1,1),0)1) is 1. — TRUE

Correct!

For CRC, the number of bits in the remainder is what determines the largest size burst error that CRC is able to detect.

TRUE

ou Answered

Ethernet is a broadcast medium.

FALSE

Correct Answer TRUE

Correct!

ARP can be used to determine whether another machine on the network is using the same IP address.

TRUE

Correct!

According to the typical DHCP scenario given in Kurose and Ross, if there are more than one DHCP server on the same network, there is a possibility that a host can lease TWO IP addresses.

FALSE

Correct!

The purpose of ICMP is to allow hosts and routers to send notification of datagram problems back to the sender.

TRUE

Correct!

By default traceroute gives 3 timings for every hop. A large variation in the value of these three timings for a hop may indicate congestion.

TRUE

Correct!

By default ping sends an ICMP echo request packets to a target machine.

TRUE

Correct!

The dictionary server uses TCP.

TRUE

Question 3

2 / 2 pts

Which of the following is the **main** reason for using CRC instead of 2D parity checking?

- CRC is more complicated than 2D parity.
- CRC is easier to implement in hardware in comparison to 2D parity.

Correct!

- CRC can detect burst errors, while 2D parity cannot.
- CRC is able to do error correction.

Question 4

0 / 2 pts

Assume A-->B means DNS server A sends a message to DNS server B. The path

A-->B, B-->C, C-->B, B-->D, D-->B, B-->A

indicates what type of query?

- recursive DNS query

ou Answered

- iterative DNS query

a loop

orrect Answer

a combination of recursive and iterative DNS queries

Question 5

6 / 6 pts

Data transmitted on a link uses the following 2D EVEN parity scheme for error detection. Each sequence of 28 bits is arranged into 4 rows of data (row 1 to row 4) and a parity bit is added at the end of every row. Finally a parity row is added after each of the other rows producing a 5x8 matrix (40 bits in total) that is sent on the link.

	col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8 (parity column)
row1	0	1	0	1	0	0	1	1
row 2	1	1	0	0	1	0	1	0
row 3	0	0	0	1	0	1	0	0
row 4	0	1	1	0	1	0	1	0
row 5 (parity row)	1	1	0	0	0	1	1	0

Suppose a receiver has received the 40 bits shown above which has **N** corrupted bits.

(a) How many columns are in error (columns 1 to 8)? 2

(b) How many rows are in error (rows 1 to 5)? 0

(a) What is the MINIMUM possible value for N? 2

Answer 1:

Correct!

2

Answer 2:

Correct! 0

Answer 3:

Correct! 2

Question 6

6 / 6 pts

End-station A wishes to transfer 12 bits to end-station B. They agree to use a CRC check using the generator polynomial $x^4 + x^3 + x + 1$.

(a) What is the value of the generator as bits? Complete the blank with the bit sequence (1's and 0's only, no spaces) representing the generator.

11011 .

(b) Suppose end-station B receives the following bits: 0 1 0 1 1 0 1 1 1 0 1 1 1 0 1 1 . Give, as a bit sequence (1's and 0's only, no spaces) , the **remainder** that occurs when a CRC check is performed on this bit sequence. 1011

(c) Is there an error? If there is an error, then fill in the blank with **E,** for error. If there was NOT an error, fill in the blank with **NE**, for no error. Any answer other than E or NE will be marked INCORRECT.

E

Answer 1:

Correct! 11011

orrect Answer 1 1 0 1 1

Answer 2:

Correct! 1011

orrect Answer 1 0 1 1

Answer 3:

Correct!

E

orrect Answer

error

orrect Answer

Error

Question 7

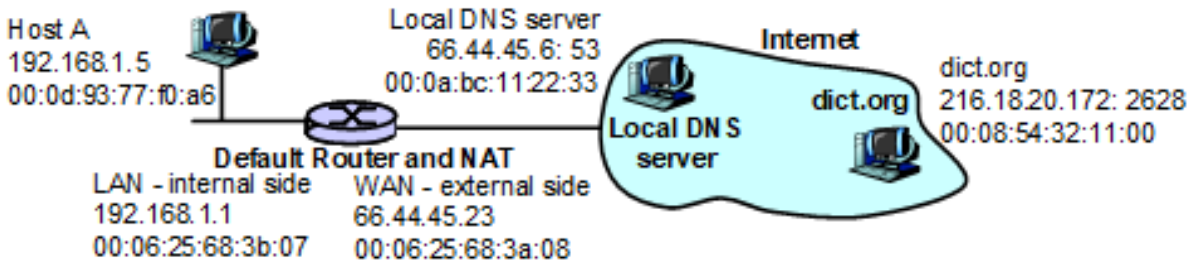
8 / 9 pts

Consider the following home network connected to the Internet with a router as shown below. The local DNS server is provided by the local ISP in the WAN. The cloud shown in the diagram depicts the ISP's network and the Internet. For servers both the IP and port is shown (e.g. 66.44.45.6: 53, which is the DNS service at IP 66.44.45.6 on port 53)

Except for Question b, the router is both a router and NAT device on the WAN connection to the Internet.

In completing the question, put **UNK** for any unknown addresses or ports except for ephemeral ports assigned by the OS put an **E**.

For MAC addresses, you need to ONLY put the last two octets (e.g. f0:a6 for Host A; ANY other inputs will be marked incorrect. For broadcast use FF:FF or ff:ff.) The network address of the LAN is 192.168.1.0/24. Please be EXTRA careful and CHECK your answers for typing mistakes.



a. Host A queries the local DNS server. Fill in the boxes below with the value of the fields for the packet as it leaves Host A.

	Frame (MAC-ID)	Datagram	Port
SRC			

	f0:a6	192.168.1.5	E
DST	3b:07	66.44.45.6	53

b. Assuming from (a) that Host A has sent a message to the local DNS server, fill in the boxes for the packet from (a) as it leaves the external side of the router. For this question assume the router is **NOT** a NAT device, the message is routed (not dropped), and the local DNS server and router is on network 66.44.45.0/24.

	Frame (MAC-ID)	Datagram	Port
SRC	3a:08	192.168.1.5	E
DST	22:33	66.44.45.6	53

c. Now assume the router is a NAT device and dict.org has received the initial message from host A. Fill in the boxes with the value of the fields for the packet as the packet leaves dict.org.

	Frame (MAC-ID)	Datagram	Port
SRC	11:00	216.18.20.172	2628
DST	UNK	66.44.45.6	53

d. Assuming that the packet from part (c) has been sent by dict.org and as in (c) assuming the router is a NAT device, fill in the boxes with the value of the fields for the reply packet received by host A.

	Frame (MAC-ID)	Datagram	Port
SRC	3b:07	216.18.20.172	2628
DST	f0:06	192.168.1.5	E

Answer 1:

Correct!

f0:a6

orrect Answer F0:A6

orrect Answer f0-a6

Answer 2:

Correct! 192.168.1.5

Answer 3:

Correct! E

Answer 4:

Correct! 3b:07

orrect Answer 3B:07

orrect Answer 3b-07

Answer 5:

Correct! 66.44.45.6

Answer 6:

Correct! 53

Answer 7:

Correct! 3a:08

orrect Answer 3A:08

orrect Answer 3a-08

Answer 8:

Correct! 192.168.1.5

Answer 9:

Correct! E

Answer 10:

Correct! 22:33

orrect Answer 22-33

Answer 11:

Correct! 66.44.45.6

Answer 12:

Correct! 53

Answer 13:

Correct! 11:00

orrect Answer 11-00

Answer 14:

Correct! 216.18.20.172

Answer 15:

ou Answered 2628

orrect Answer E

Answer 16:

Correct! UNK

orrect Answer unknown

Answer 17:

ou Answered 66.44.45.6

orrect Answer 66.44.45.23

Answer 18:

ou Answered 53

orrect Answer UNK

orrect Answer unknown

Answer 19:

Correct! 3b:07

orrect Answer 3B:07

orrect Answer 3b-07

Answer 20:

Correct! 216.18.20.172

Answer 21:

Correct! 2628

Answer 22:

ou Answered f0:06

orrect Answer f0:a6

orrect Answer F0:A6

orrect Answer f0-a6

Answer 23:

Correct! 192.168.1.5

Answer 24:

Correct! E

remarked

Question 8

2 / 3 pts

Match the protocol data unit on the left with the drop-down item corresponding to the physical end-point of the protocol.

Correct! **Ethernet Frame** adapter

Correct! **TCP segment** socket

ou Answered **IP Datagram** host

Correct Answer adapter

Other Incorrect Match Options:

- host
- port

Question 9

2.4 / 3 pts

Consider the following statements about socket programming for TCP. Match the statement on the left to the drop-down item that is most accurate.

You can assume that all network function calls return without an error.

Correct! **The first step in a server program is for the program to create a socket.** the statement is true

Correct! **The listen() call must occur before the bind() call.** the statement is false

ou Answered

In a server program a recv() needs to happen before any send(). — the statement is true

Correct Answer — the statement is false

Correct! **The accept() call returns a new file descriptor.** — the statement is true

Correct! **The connect() call on the client occurs before the accept() call for that connection on the server side.** — the statement is true

Question 10

3 / 3 pts

What pieces of information, essential for communicating with hosts and services on the Internet, does a DHCP client obtain from the DHCP server after a successful exchange of all DHCP messages?

Correct! ☑ IP address of the default Router

☐ MAC-ID of the default router

Correct! ☑ IP address of a DNS server

Correct! ☑ Network Mask

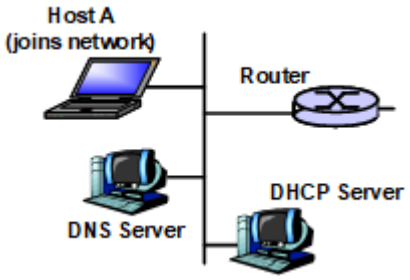
Correct! ☑ an IP address

☐ MAC-ID of the host

Question 11

2 / 4 pts

Consider the following network where host A has just joined the network. The network has a router, a local DNS server, and a DHCP server.



Assume that all of the ARP caches and the DNS caches for all of the machines on the network are **empty**. After connecting to the network, Host A opens up a simple browser and enters www.example.com. You can assume that the webpage is very simple and this is the ONLY DNS query made.

List the communications that occur inside the local network. List them in the order in which they occur, from when A first joins the network until it receives back the requested web-page. You do not have to detail every packet but simply outline the source and destination of the interaction and why it occurs.

For example:

"A arps for the DHCP server's MAC-ID" or

"The router contacts the DHCP server to obtain an IP address". As you can see, you do not have to list all of the DHCP messages involved in the interaction.

Your Answer:

A broadcasts a DHCP DISCOVER packet

DHCP replies to A with offers

A broadcasts request for one of the received offers

DHCP ACK A use of IP address

A makes an ARP request for the MAC-ID of the DNS server

The DNS server makes an ARP request for the MAC-ID of the router.

A makes an ARP request for the MAC-ID of the router

1. When A joins it broadcasts a DHCP message to obtain an IP address from the DHCP server.

2. A arps for MAC-ID of the local DNS server.

3. A sends a DNS message to the DNS server requesting it to resolve the IP address for **www.example.com (http://www.example.com)** .

4. The DNS server arps for the router MAC-ID

5. The DNS server sends a frame to the router, destined for a DNS nameserver. There may be serveral messages for the DNS server in order to resolve the address.

6. The DNS server sends the resolved IP address to A

7. A arps for the router MAC-ID

8. A sends a frame to the router, destined for a the HTTP server for **www.example.com (http://www.example.com)** and receives back the webpage.

Unanswered

Question 12

0 / 0 pts

If necessary, use the space below to record any assumptions you may have made in answering the questions. Be sure to state the question number and assumption.

Your Answer: