Question 1. When a single parity bit is added to a binary message, all errors that alter an odd number of bits will be detected, and all errors that modify an even number of bits will go undetected. Things get a bit trickier when 2 dimensional parity bits are used. Depending on the number of bits altered by an error we can either say:

(A) All errors containing this number of bits will be detected, or

(B) Some errors containing this number of bits will be detected and others will go undetected.

For each type of error described below, indicate which of these two options describes the way a 2 dimensional parity scheme would handle such errors. In each case, if you answer (A), provide one example of an error that would be detected by modifying the bits in the "Detectable Error" table provided (and leave the "Undetectable Error" table unchanged. If you answer (B), provide one example of an error that would be detected in the "Detectable Error" table and another of an error that would go undetected in the "Undetectable Error" table. In all cases, assume that the parity bits are only being used to detect errors. That is, assume that if any row or column contains a odd number of 1's that the data will be treated as an error without making any attempt to correct the error.

(a) 3 bit errors: A or B

3 Bit Detectable Error

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

. 3 Bit Undetectable Error

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

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(b) 4 bit errors: A or B

4 Bit Detectable Error

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

. 4 Bit Undetectable Error

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

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(c) 5 bit errors: A or B

5 Bit Detectable Error

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

. 5 Bit Undetectable Error

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

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(d) 6 bit errors: A or B

6 Bit Detectable Error

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

. 6 Bit Undetectable Error

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

Question 2. For this question, we would like you to examine the contents of a collection of packets that were sent back and forth through the network as part of an HTTP transaction and answer some questions about the behavior of the machines involved.

We have seen that we can use TCPCapture to examine the actual packets sent back and forth while accessing a network server. Unfortunately, TCPCapture does not provide a good way to print or save a description of the packets captured. As a result, we have used a similar program named Wireshark to capture packets and have attached to this handout the information Wireshark provided. In Wiresharks output, each packet is described by a series of four lines. The first line includes the packet number and its size. The remaining lines contain details of the various protocol headers (IP and TCP) found at the beginning of the packet.

Using these packet descriptions, please answer the following questions.

a) What is the IP address of the server participating in this exchange of packets? What is the IP address of the client?

b) How many TCP connections are created during this exchange? Identify the first packet of each connection.

c) Which packets initiate the closing of each connection? Is the close initiated by the client or the server?

d) The capture shown is not quite complete. What packets are missing? (Just describe the function of the missing packets. Do not try to describe them in detail.)

e) Which packet contains the first acknowledgment for the data the server sends in response to the first GET request from the client?

f) Which packet contains the acknowledgment for the first GET request from the client?

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Frame 1 (78 bytes on wire, 78 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298596924, Len: 0
    Flags: 0x0002 (SYN)

Frame 2 (74 bytes on wire, 74 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458096306, Ack: 2298596925, Len: 0
    Flags: 0x0012 (SYN, ACK)

Frame 3 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298596925, Ack: 2458096307, Len: 0
    Flags: 0x0010 (ACK)

Frame 4 (336 bytes on wire, 336 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298596925, Ack: 2458096307, Len: 270
    Flags: 0x0018 (PSH, ACK)

Frame 5 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458096307, Ack: 2298597195, Len: 1448
    Flags: 0x0010 (ACK)

Frame 6 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458097755, Ack: 2298597195, Len: 1448
    Flags: 0x0010 (ACK)

Frame 7 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298597195, Ack: 2458099203, Len: 0
    Flags: 0x0010 (ACK)

Frame 8 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458099203, Ack: 2298597195, Len: 1448
    Flags: 0x0010 (ACK)

Frame 9 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458100651, Ack: 2298597195, Len: 1448
    Flags: 0x0010 (ACK)

Frame 10 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458102099, Ack: 2298597195, Len: 1448
    Flags: 0x0010 (ACK)

Frame 11 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298597195, Ack: 2458103547, Len: 0
    Flags: 0x0010 (ACK)

Frame 12 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458103547, Ack: 2298597195, Len: 1448
    Flags: 0x0010 (ACK)

Frame 13 (1048 bytes on wire, 1048 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458104995, Ack: 2298597195, Len: 982
    Flags: 0x0018 (PSH, ACK)

Frame 14 (385 bytes on wire, 385 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298597195, Ack: 2458105977, Len: 319
    Flags: 0x0018 (PSH, ACK)

Frame 15 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458105977, Ack: 2298597514, Len: 1448
    Flags: 0x0010 (ACK)

Frame 16 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458107425, Ack: 2298597514, Len: 1448
    Flags: 0x0010 (ACK)
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Frame 17 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458108873, Ack: 2298597514, Len: 1448
    Flags: 0x0010 (ACK)

Frame 18 (78 bytes on wire, 78 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458110321, Ack: 2298597514, Len: 12
    Flags: 0x0018 (PSH, ACK)

Frame 19 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298597514, Ack: 2458110333, Len: 0
    Flags: 0x0010 (ACK)

Frame 20 (78 bytes on wire, 78 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63071 (63071), Dst Port: http (80), Seq: 932711780, Len: 0
    Flags: 0x0002 (SYN)

Frame 21 (74 bytes on wire, 74 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63071 (63071), Seq: 995105002, Ack: 932711781, Len: 0
    Flags: 0x0012 (SYN, ACK)

Frame 22 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63071 (63071), Dst Port: http (80), Seq: 932711781, Ack: 995105003, Len: 0
    Flags: 0x0010 (ACK)

Frame 23 (390 bytes on wire, 390 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63071 (63071), Dst Port: http (80), Seq: 932711781, Ack: 995105003, Len: 324
    Flags: 0x0018 (PSH, ACK)

Frame 24 (1514 bytes on wire, 1514 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63071 (63071), Seq: 995105003, Ack: 932712105, Len: 1448
    Flags: 0x0010 (ACK)

Frame 25 (1377 bytes on wire, 1377 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63071 (63071), Seq: 995106451, Ack: 932712105, Len: 1311
    Flags: 0x0018 (PSH, ACK)

Frame 26 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63071 (63071), Dst Port: http (80), Seq: 932712105, Ack: 995107762, Len: 0
    Flags: 0x0010 (ACK)

Frame 27 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63070 (63070), Seq: 2458110333, Ack: 2298597514, Len: 0
    Flags: 0x0011 (FIN, ACK)

Frame 28 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.2 (137.165.8.2), Dst: 137.165.8.83 (137.165.8.83)
Transmission Control Protocol, Src Port: http (80), Dst Port: 63071 (63071), Seq: 995107762, Ack: 932712105, Len: 0
    Flags: 0x0011 (FIN, ACK)

Frame 29 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63070 (63070), Dst Port: http (80), Seq: 2298597514, Ack: 2458110334, Len: 0
    Flags: 0x0010 (ACK)

Frame 30 (66 bytes on wire, 66 bytes captured)
Internet Protocol, Src: 137.165.8.83 (137.165.8.83), Dst: 137.165.8.2 (137.165.8.2)
Transmission Control Protocol, Src Port: 63071 (63071), Dst Port: http (80), Seq: 932712105, Ack: 995107763, Len: 0
    Flags: 0x0010 (ACK)
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