Started on	Friday, 15 October 2021, 1:52 PM
State	Finished
Completed on	Friday, 15 October 2021, 5:05 PM
Time taken	3 hours 13 mins
Grade	**84.71** out of 100.00

Question **1**

Correct

Mark 1.71 out of 2.00

Select all the items that can cause transmission errors:

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. Interference (two waveforms colliding) ✔
- b. Jitter (variations in signal timings) ✔
- c. Faulty routers ✔
- d. Jamming of a signal ✔
- e. Weak signal strength ✔
- f. Crosstalk (signals in one circuit interfering with signals in another circuit) ✔
- g. Thermal noise (noise generated by random thermal motion) ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.71/2.00**.

Question **2**

Correct

Mark 2.00 out of 2.00

Using odd parity, what is the parity bit if the frame is 01010111?

Write just the additional parity bit, rather than the full codeword

Penalty regime: 100%

Answer: 0 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **3**

Correct

Mark 2.00 out of 2.00

Using even parity, what is the parity bit if the frame is 01010111?

Write just the additional parity bit, rather than the full codeword

Penalty regime: 100%

Answer: 1 ✔

Correct

Marks for this submission: 2.00/2.00.

Information

Alice sends the data block (E34F 2396 4427 99F3) to Bob.

With this information, answer the following questions.

Question **4**

Correct

Mark 3.00 out of 3.00

What is the partial sum on E34F and 2396? If there is carry on the leftmost bit, please add it to the sum.

Please give the answer in hexadecimal.

Penalty Regime: 33%, 66%, 100%

Answer: 06e6 ✔

Correct

Marks for this submission: 3.00/3.00.

Question **5**

Correct

Mark 5.00 out of 5.00

Alice sends the data block (E34F 2396 4427 99F3) to Bob.

What is the result after the ones-complement addition on the whole data block send by Alice?

Please give the answer in hexadecimal.

Penalty Regime: 33%, 66%, 100%

Answer: e500 ✔

Correct

Marks for this submission: 5.00/5.00.

Question **6**

Correct

Mark 4.00 out of 4.00

Compute the Internet checksum for the data block. Give the result as a hexadecimal number.

Penalty Regime: 33%, 66%, 100%

Answer: 1aff ✔

Correct

Marks for this submission: 4.00/4.00.

Question **7**

Correct

Mark 2.00 out of 2.00

The Internet checksum in the IP header is needed even when the link layer performs perfect error checking, because:

Select one:

a. the Cyclic Redundancy Check (CRC) check is weaker than the Internet Checksum and therefore could miss out on more errors.

b. even if it travels through the transmission medium perfectly, router memory could cause an error in the packet. ✔

c. this allows the packet to do Forward Error Correction (FEC) if there is a one bit error.

d. every layer in the Open Systems Interconnection (OSI) model needs an error-detecting technique.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Information

In CRC suppose we are given a divisor pattern, G=110011 and a data block D=11100011, apply CRC to detect errors.

Please answer the following questions.

Question **8**

Correct

Mark 4.00 out of 4.00

What would be the size in bits of the Frame Check Sequence (FCS)?

Penalty Regime: 33%, 66%, 100%

Answer: 5 ✔

Correct

Marks for this submission: 4.00/4.00.

Question **9**

Correct

Mark 4.00 out of 12.00

What is the corresponding Frame Check Sequence (FCS)? Please enter the FCS in the binary format.

Penalty regime 33%, 66%, 100%

Answer: 11010 ✔

Correct

Marks for this submission: 12.00/12.00. Accounting for previous tries, this gives **4.00/12.00**.

Information

Suppose there are senders A and B that want to send data between each other although there is interference on the channel connecting them. To overcome this issue both A and B agree on a Hamming code to use so that errors can be detected or corrected (depending on the severity of the error). The messages and the codewords they map to are given below.

Message	Codeword
0000	0000000
0001	0001111
0010	0010011
0011	0011100
0100	0100101
0101	0101010
0110	0110110
0111	0111001
1100	1100011
1101	1101100
1110	1110000
1111	1111111
1000	1000110
1001	1001001
1010	1010101
1011	1011010

With this information, answer the following questions.

Question **10**

Correct

Mark 2.00 out of 2.00

Suppose that user A sends user B the codeword 0110110. Assuming there were no errors, what is the message that user B has received?

Penalty Regime: 33%, 66%, 100%

Answer: 0110 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **11**

Correct

Mark 2.00 out of 2.00

Suppose now that user B receives a codeword 1001011 from user A. What is the Hamming distance from 1011010?

Penalty Regime: 33%, 66%, 100%

Answer: 2 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **12**

Correct

Mark 2.00 out of 2.00

With the same codeword as before (1001011), what is the Hamming distance from the received codeword and 1001001?

Penalty Regime: 33%, 66%, 100%

Answer: 1 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **13**

Correct

Mark 3.00 out of 3.00

With reference to the last two questions, suppose user B receives 1001011 from user A. Which conclusion can B draw?

Penalty Regime: 50%, 100%

Select one:

- a. We have detected two bit errors in the received block.
- b. It could either be two (detectable) bit errors or one (correctable) bit error. Without further configuration B cannot decide on the proper action. ✔ Correct. Both is possible (although in general these two events do not have the same probability), user A could either have sent 1011010 or 1001001, and B cannot reliably distinguish between these possibilities. It can only suspect that the option with fewer bit errors is the more likely one.
- c. There is one bit error in the received block which we are able to correct.

Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.

Question **14**

Correct

Mark 2.00 out of 2.00

There is another class of Hamming codes that are extended with an additional parity bit, providing the ability to detect up to three errors, correct up to two errors, or simultaneously correct up to one error and detect up to two errors. How would the code rate of the extended Hamming code compare to normal Hamming codes? The code rate is defined as the ratio of the number k of user data bits to the total number n of bits for the coded message (which includes the user data and redundant bits), i.e. k/n.

Penalty Regime: 100%

Select one:

a. The code rate of the extended hamming code would be larger.

b. The code rate of the extended hamming code would be smaller. ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **15**

Correct

Mark 2.00 out of 2.00

Is the Automatic Repeat Request (ARQ) protocol closed loop or open loop error control?

Penalty regime: 100%

Select one:

a. ARQ is open loop error control as ARQ does not send feedback

b. ARQ is closed loop error control as ARQ sends feedback ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **16**

Correct

Mark 3.00 out of 3.00

Match the following descriptions with the corresponding ARQ types.

Penalty regime: 33%, 66%, 100%

When an error is detected, the frame in question is retransmitted, as well as all subsequent frames that have been previously transmitted, after the last acknowledgement.	Go-back-N ARQ ✔
For all packets, the sending station waits for an acknowledgement for the last packet before sending the next packet	Stop-and-wait ARQ ✔
With a window size greater than 1, when an error is detected, only the frame in question is retransmitted.	Selective-Repeat ARQ ✔

Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.

Question **17**

Correct

Mark 2.00 out of 2.00

If stop and wait is treated like a sliding window scheme, what is the maximum window size?

Penalty Regime: 33%, 66%, 100%

Select one:

- a. 0
- b. 1 ✔
- c. 2
- d. 3
- e. 4

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Information

Two neighbour nodes (A and B) use the ARQ mechanism stop-and-wait for their data transfer. Assuming A is transmitting and B is receiving, show the number of usable sequence numbers at A for the following succession of events.

Question **18**

Correct

Mark 1.33 out of 2.00

After A sends frame 0, but before A receives an acknowledgement from B for 0, the number of usable sequence numbers at A becomes

0

✔ .

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.33/2.00**.

Question **19**

Correct

Mark 2.00 out of 2.00

After A sends frames 0 and receives acknowledgement from B for 0, the number of usable sequence number at A

1

✔ .

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Information

Two neighbor nodes (A and B) use go-back-N with a 3-bit sequence number and a window size of N=4. Assuming A is transmitting and B is receiving, show the window positions (sequence numbers currently in the window) for the following succession of events.

Question **20**

Correct

Mark 2.00 out of 2.00

Before A sends any frames, the number of usable sequence numbers of A is

4

✔ .

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **21**

Correct

Mark 2.00 out of 2.00

Before A sends any frame, the first usable sequence number in the sliding window of A is

0

✔ .

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **22**

Correct

Mark 2.00 out of 2.00

After A sends frames 0, 1, 2 and receives acknowledgement from B for 0 and 1, the number of usable sequence number of A becomes

3

✔ .

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **23**

Correct

Mark 2.00 out of 2.00

After A sends frames 0, 1, 2 and receives acknowledgement from B for 0 and 1, the sequence number of the next new frame of A is

3

✔ .

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **24**

Correct

Mark 2.00 out of 2.00

After B receives frames 0, 1, 2 and acknowledges 0, 1, 2, B expects the sequence number of the next in-order packet to be

3

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **25**

Correct

Mark 2.00 out of 2.00

After A sends frames 3, 4, and 5 and B acknowledges 4 and the ACK is received by A, the number of usable sequence numbers at A becomes

3

Penalty regime 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **26**

Correct

Mark 2.00 out of 2.00

After B receives frames 3 and 4, B expects the sequence number of the next in-order packet to be

5

Penalty regime: 33%, 66%, 100%

Correct

Marks for this submission: 2.00/2.00.

Question **27**

Correct

Mark 1.33 out of 2.00

A sends frames 4, 5, 6, 7 but receives ACK4 only. What frames are resent after A experiences a timeout? Select all the frames that would be resent.

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 4
- b. 5 ✔
- c. 6 ✔
- d. 7 ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.33/2.00**.

Information

Two neighbor nodes (A and B) use Selective Repeat with a 3-bit sequence number and a window size of N=4. Assuming A is transmitting and B is receiving, please answer the following questions.

Question **28**

Correct

Mark 1.33 out of 2.00

After A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly, which ACKs will B send to A?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. ACK2 ✔
- b. ACK3 ✔
- c. ACK1
- d. ACK0 ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.33/2.00**.

Question **29**

Correct

Mark 2.00 out of 2.00

After A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly, which frame(s) will B deliver to the upper layer?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 3
- b. 1
- c. 2
- d. 0 ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **30**

Correct

Mark 2.00 out of 2.00

After A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly, which frame(s) will be buffered at B?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 1
- b. 3 ✔
- c. 2 ✔
- d. 0

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **31**

Correct

Mark 3.00 out of 3.00

First A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly; B then sends back a few ACKs, delivers in-order frame(s) and buffers out-of-order frame(s); after a while B receives frame 0 again. Which action(s) will B take?

Penalty regime: 33%, 66%, 100%

Select one:

- a. B ignores this frame and does nothing;
- b. B sends back ACK2 and ACK3;
- c. B sends back ACK1;
- d. B sends back ACK0; ✔

Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.

Question **32**

Correct

Mark 2.00 out of 2.00

First A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly; then B sends ACKs but A receives ACK0 only. Which sequence numbers are in A's window?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 0
- b. 3 ✔
- c. 1 ✔
- d. 4 ✔
- e. 2 ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **33**

Correct

Mark 1.33 out of 2.00

First A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly; then B sends ACKs but A receives ACK0 only. Which frame(s) will be re-transmitted on timeout at A?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 3
- b. 2
- c. 1 ✔
- d. 0

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.33/2.00**.

Question **34**

Correct

Mark 2.00 out of 2.00

First A sends frames 0, 1, 2, 3 and B receives frames 0, 2, 3 correctly; then B sends back ACKs, delivers in-order frame(s) and buffers out-of-order frame(s). After a while B receives frame 1 correctly. Now which frame(s) will be delivered to the upper layer at B?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 3 ✔
- b. 2 ✔
- c. 1 ✔
- d. 0

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **35**

Correct

Mark 2.00 out of 2.00

Suppose that a selective-repeat ARQ is used with a window size of 8, what is the minimum number of bits for a sequence number to stop acknowledgements being misidentified? Think about the case in which the sequence number loops back around.

Penalty regime: 33%, 66%, 100%

Select one:

- a. 1
- b. 2
- c. 3
- d. 4 ✔
- e. 5

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **36**

Correct

Mark 1.33 out of 2.00

Which of the following statements are correct about TCP flow control?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. TCP specification requires the sender to continue to send one-data-byte segments to its receiver even if the receiver's buffer is full. ✔
- b. In TCP flow control, the sender maintains a variable called **receive window** (RcvWindow) which tells itself how much free buffer space is available at the receiver. ✔
- c. TCP flow control is a speed-matching service. ✔
- d. TCP flow control is the same as TCP congestion control.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.33/2.00**.

Question **37**

Correct

Mark 0.67 out of 2.00

When TCP does the round-trip time sampling, it never computes a sample round-trip time (**SampleRTT**) for a segment that has been retransmitted. Why?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. If a sender retransmits a segment and receives its ACK, it does not know whether this ACK corresponds to the earlier segment or the retransmitted segment. The round-trip time estimation becomes inaccurate. ✔
- b. A retransmitted segment is more likely to be corrupted.
- c. A retransmitted segment is more likely to be delayed or lost again.
- d. Retransmission can cause network congestion.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.67/2.00**.

Question **38**

Correct

Mark 0.67 out of 2.00

Which of the following statements are correct in regarding to TCP reliable data transfer service?

Select one or more:

- a. TCP usually uses cumulative acknowledgements. ✔
- b. Some segments can be retransmitted before timeout. This is called **fast retransmit**. ✔
- c. The reliable data transfer mechanism in TCP is different from both Go-back-N and Selective Repeat. ✔
- d. When there is a timeout, the sender retransmits all not-yet-acknowledged segments.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.67/2.00**.

Question **39**

Correct

Mark 2.00 out of 3.00

Suppose when a TCP connection begins, its congestion window (CongWin) is initialised to 1MSS (Max Segment Size) and the threshold for CongWin is 16 MSS. Now TCP is in the **Slow Start** phase. Roughly after how many round trips, CongWin will grow to the threshold?

Penalty regime: 33%, 66%, 100%

Select one:

- a. 5
- b. 3
- c. 2
- d. 4 ✔

Your answer is correct.

Correct

Marks for this submission: 3.00/3.00. Accounting for previous tries, this gives **2.00/3.00**.

◄ Quiz: Error Detection, Correction, and Control Problems

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Lab test 2020 (practice copy) ►