Started on	Tuesday, 9 November 2021, 2:31 PM
State	Finished
Completed on	Tuesday, 9 November 2021, 4:01 PM
Time taken	1 hour 30 mins

Question **1**

Correct

Marked out of 1.00

The size of an IPv6 address is 64 bits.

Select one:

- True
- False

Your answer is correct.

Question **2**

Complete

Marked out of 5.00

Hierarchical routing is used in the Internet. Routers are organised into autonomous systems (ASs). How does a router, within some AS, know how to route a packet to a destination that is outside the AS?

Using inter AS routing to exchange info so a package from a AS can arrive at another host - another AS. BGP routing protocol create forwarding tables to know what next hop to send a package, and these tables are created with bellman-fords routing algorithm.

Comment:
not complete

Question **3**

Complete

Marked out of 4.00

Please try to explain why the window size must be less than or equal to half the size of the sequence number space for SR (Selective Repeat) protocols.

Suppose that a selective-repeat ARQ is used with a window size of N, The minimum number of bits for a sequence number to stop acknowledgements being misidentified can be calculated by 2 * N = K, where K = 2^C.

Therefore a C bit sequence to produce 2*N package seq_num that can't identify false ACK from a window size of N

The maximum possible difference a window size of sender A and receiver B is by the size of the window N. This is because B could have sent all the ACKs in the sender A's window, but B's ACKs have been lost and never received by A. A's window size therefore not update and move forward while B has by N. This is why the window size N must be less than or equal to hald the size of the sequence number (2*N) to avoid misidentifying acknowledgements

Comment:
correct

Question **4**

Correct

Marked out of 1.00

DNS uses the same format for its query and reply messages.

Select one:

- (•) True
- ( ) False

Your answer is correct.

Question **5**

Correct

Marked out of 2.00

Which of the following protocols typically builds on UDP?

Select one:

- ( ) a. HTTP
- ( ) b. SMTP
- (•) c. DNS
- ( ) d. BGP

Your answer is correct.

Question **6**

Complete

Marked out of 3.00

SMTP, as the main application-layer protocol for email, has been designed for pushing emails from one host to another. For example, if Alice wants to send an email to Bob, Alice's user agent can push this email to BoB's mail server directly, without using Alice's mail server. However, Alice's user agent does not communicate with Bob's mail server directly in practice. It first uses SMTP to push the email into Alice's mail server, and then Alice's mail server uses SMTP to relay the email to Bob's mail server. Please justify this.

Alice can just send to bob's mail server in one step, but in practice we use 2 steps, as Alice's mail server can serve as middle man. This is justified as it takes account of scenarios when bobs mail server is down and Alice's mail server will keep attempting to talk to Bob's Mail server until Bob's Mail server is up and running again.

Comment:
correct

Question **7**

Correct

Marked out of 1.00

In today's Internet the BGP protocol is the only relevant inter-AS routing protocol.

Select one:

- (•) True
- ( ) False

Your answer is correct.

Question **8**

Correct

Marked out of 2.00

Which of the following methods are new methods in a request message of HTTP 1.1, compared with HTTP 1.0?

- [x] a. PUT
- [x] b. DELETE
- [ ] c. HEAD
- [ ] d. POST
- [ ] e. GET

Your answer is correct.

Question **9**

Correct

Marked out of 2.00

What is the *protocol* number (in decimal) in the IPv4 header when an entire IPv6 datagram is encapsulated in an IPv4 packet (*tunneling*)?

- ( ) a. 6
- ( ) b. 47
- ( ) c. 17
- (•) d. 41

Your answer is correct.

Question **10**

Correct

Marked out of 2.00

Which of the following protocols are mail access protocols?

Select one or more:

- [x] a. IMAP
- [ ] b. None of the choices
- [x] c. POP3
- [ ] d. SMTP

Your answer is correct.

Question **11**

Correct

Marked out of 1.00

A multi-homed stub AS allows traffic to pass through because it is connected to multiple ASes.

Select one:

- True
- False

Your answer is correct.

Question **12**

Correct

Marked out of 1.00

Which of the following statements regarding the domain name system (DNS) are correct?

Select one or more:

- a. DNS servers are organized in a hierarchical fashion to deal with scaling issues
- b. The decentralized design of DNS helps to avoid a single point of failure
- c. DNS is commonly used with HTTP and SMTP
- d. DNS provides other services such as load distribution in addition to the basic service of resolving hostnames into IP addresses

Your answer is correct.

Question **13**

Correct

Marked out of 1.00

The Bellman-Ford algorithm assumes that each node in the network knows the full network topology.

Select one:

- True
- False

Your answer is correct.

Question **14**

Correct

Marked out of 1.00

In NAT (Network address translation), port numbers have been used for addressing hosts.

Select one:

- True
- False

Your answer is correct.

Question **15**

Correct

Marked out of 2.00

Which of the following are used together for identifying a TCP connection?

Select one or more:

- a. Destination port number
- b. Source IP address
- c. Destination IP address
- d. Source port number

Your answer is correct.

Question **16**

Correct

Marked out of 2.00

In the DV-algorithm (Bellman-Ford), which information is exchanged between a node and its neighbours?

Select one or more:

- a. The number of nodes in the network
- b. Its own distance vector
- c. All distance vectors it has received from its neighbours
- d. All of the choices

Your answer is correct.

Question **17**

Correct

Marked out of 2.00

Which of the following services are provided by TCP?

Select one or more:

- a. Flow control
- b. Extending host-to-host delivery to process-to-process delivery
- c. Guaranteed delivery of application layer messages
- d. Congestion control

Your answer is correct.

Question **18**

Correct

Marked out of 2.00

Which layer is RIP typically implemented at?

Select one:

- a. Network layer
- b. Physical layer
- c. Application layer
- d. Transport layer

Your answer is correct.

Question **19**

Incorrect

Marked out of 7.00

Please implement a simplified version of the TCP receiver side.

The *input* of your function **GenACK()** is a list of sequence numbers used by successive segments arriving at the TCP receiver. Note that the sequence number of a segment is the byte-stream number of the first byte in the segment in TCP.

Your function *outputs* a list of ACK numbers for these segments.

If the segment is in-order, its corresponding ACK number is the sum of the sequence number of the segment and its size.

We assume that every segment is of the same size, 100 bytes and the first segment is always in-order.

If the segment is out-of-order, its corresponding ACK number is the ACK number for the most recent in-order segment. Out-of-order segment will be discarded.

For example:

Test	Result
`print(GenACK([1,101,201]))`	`[101, 201, 301]`
`print(GenACK([1]))`	`[101]`
`print(GenACK([1,101]))`	`[101, 201]`
`print(GenACK([1,201,301]))`	`[101, 101, 101]`
`print(GenACK([1,201,101]))`	`[101, 101, 201]`
`print(GenACK([1,1]))`	`[101, 101]`

Answer: (penalty regime: 0, 10, 20, ... %)

Reset answer

Ace editor not ready. Perhaps reload page?
Falling back to raw text area.

```
def GenACK(segments):
    segSize = 100
```

	Test	Expected	Got	
✖	`print(GenACK([1,101,201]))`	`[101, 201, 301]`	None	✖
✖	`print(GenACK([1]))`	`[101]`	None	✖
✖	`print(GenACK([1,101]))`	`[101, 201]`	None	✖
✖	`print(GenACK([1,201,301]))`	`[101, 101, 101]`	None	✖
✖	`print(GenACK([1,201,101]))`	`[101, 101, 201]`	None	✖
✖	`print(GenACK([1,201,101,101]))`	`[101, 101, 201, 201]`	None	✖

	Test	Expected	Got	
✖	`print(GenACK([1,1]))`	`[101, 101]`	None	✖

Some hidden test cases failed, too.
Your code must pass all tests to earn any marks. Try again.

Show differences

Question **20**

Correct

Marked out of 4.00

TCP uses a timeout/retransmit scheme to recover from lost segments. TCP needs to set the timeout value at least larger than the connection's round-trip time (RTT). TCP estimates the round-trip time based on the sampled RTTs, i.e., SampleRTTs. Upon obtaining a new SampleRTT, TCP updates EstimatedRTT according to the following formula:

EstimatedRTT = (1-alpha) * **EstimatedRTT** + alpha***SampleRTT**.

The new value of EstimatedRTT is a weighted combination of the previous value of EstimatedRTT and the new value of SampleRTT.

Fill in the following Python3 function with the correct expression. The input of the function is a list of SampleRTTs. alpha = 0.125. Assume the first EstimatedRTT is equal to the first SampleRTT. Your function should output the last updated EstimatedRTT after processing all the SampleRTTs.

For example:

Test	Result
`print ("{:.3f}".format(EstimatedRTT([1])))`	1.000
`print ("{:.3f}".format(EstimatedRTT([1,2])))`	1.125
`print ("{:.3f}".format(EstimatedRTT([1,2,3])))`	1.359

Answer: (penalty regime: 0, 10, 20, ... %)

Reset answer

Ace editor not ready. Perhaps reload page?
Falling back to raw text area.

```
def EstimatedRTT(sampleRTT):
    alpha = 0.125

    #timeout value at least larger than the connection's round-trip time (RTT)
    #round-trip time based on the sampled RTTs, i.e., SampleRTTs.
    # Upon obtaining a new SampleRTT,
    # TCP updates EstimatedRTT according to the following formula:
    #EstimatedRTT = (1-alpha) * EstimatedRTT + alpha*SampleRTT.
```

	Test	Expected	Got	
✔	`print ("{:.3f}".format(EstimatedRTT([1,2,3,4])))`	1.689	1.689	✔
✔	`print ("{:.3f}".format(EstimatedRTT([1,2,3,4,5])))`	2.103	2.103	✔
✔	`print ("{:.3f}".format(EstimatedRTT([1])))`	1.000	1.000	✔
✔	`print ("{:.3f}".format(EstimatedRTT([1,2])))`	1.125	1.125	✔
✔	`print ("{:.3f}".format(EstimatedRTT([1,2,3])))`	1.359	1.359	✔

Passed all tests! ✔

Question **21**

Correct

Marked out of 2.00

Which of the following protocol mechanisms are used in TCP's reliable data transfer service?

Select one or more:

- a. Acknowledgements
- b. Timers
- c. Sequence numbers
- d. Checksum

Your answer is correct.

Question **22**

Correct

Marked out of 2.00

Which of the following applications have tight timing constraints?

Select one or more:

- a. Email
- b. Virtual environments;
- c. Internet telephony;
- d. Teleconferencing;

Your answer is correct.

Question **23**

Complete

Marked out of 3.00

TCP uses timeout/retransmission to recover from lost segments. TCP estimates the round-trip time between sender and receiver in order to configure the length of its timeout intervals. TCP does this estimation by sampling the round-trip time and calculates an **exponential weighted moving average (EWMA)** of the samples. What is(are) the advantage(s) of using EWMA compared to using *ordinary* average? Here the ordinary average refers to arithmetic mean to calculate which we sum up the sample values and divide the sum by the number of samples.

it ignores previous and put higher weight on recent RTT

Comment:
not accurate

Question **24**

Correct

Marked out of 1.00

Poisoned reverse can solve the count-to-infinity problem in distance vector routing.

Select one:

- True
- False

Your answer is correct.

Question **25**

Correct

Marked out of 2.00

Which of the following statements about the Selective Repeat (SR) Protocol are correct:

Select one or more:

- [x] a. The SR receiver may acknowledge a correctly received packet whether or not it is in order;
- [ ] b. The SR receiver will acknowledge a correctly received in-order packet only;
- [x] c. Out-of-order packets may be buffered to be delivered to the upper layer later;
- [ ] d. In-order packets will also be buffered to be delivered to the upper layer later;

Your answer is correct.

Question **26**

Correct

Marked out of 1.00

Transport layer flow control deals with end hosts, not with intermediate routers.

Select one:

- (•) True
- ( ) False

Your answer is correct.

Question **27**

Correct

Marked out of 2.00

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

Select one:

- ( ) a. 2
- (•) b. 1
- ( ) c. 4
- ( ) d. 8

Your answer is correct.

Question **28**

Correct

Marked out of 2.00

Concerning the **slow start** phase of TCP congestion control, which of the following statements is correct?

Select one:

- a. During this phase, the TCP senders begins by transmitting at a fast rate and increases its sending rate exponentially
- b. During this phase, the TCP senders begins by transmitting at a slow rate and increases its sending rate exponentially
- c. During this phase, the TCP senders begins by transmitting at a slow rate and increases its sending rate linearly
- d. During this phase, the TCP senders begins by transmitting at a fast rate and increases its sending rate linearly

Your answer is correct.

Question **29**

Correct

Marked out of 2.00

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

- a. TCP uses network-assisted congestion control because routers provide explicit feedback to the sender regarding the congestion state in the network.
- b. A loss event at the sender is either a timeout or the receipt of three duplicate ACKs.
- c. When a TCP connection starts, the value of CongWin (congestion window) is typically initialised to 1MSS.
- d. Different versions of TCP may react differently to a loss event, e.g., the receipt of three duplicate ACKs.

Your answer is correct.

Question **30**

Correct

Marked out of 3.00

Which of the following statements about RIP are correct?

- a. RIP is based on distance-vector routing algorithm.
- b. RIP routers exchange advertisements approximately every 30 seconds.
- c. RIP is widely used for inter-AS routing in the Internet.
- d. The maximum cost of a path is limited to 15 in RIP.

Your answer is correct.

Question **31**

Correct

Marked out of 2.00

If the value of the "length" field of a UDP segment is 1024, then the number of bytes in the payload (application data) is

Answer: 1016

Your answer is correct

Question **32**

Correct

Marked out of 2.00

Which of the following statements are(is) correct?

Select one or more:

- [x] a. TCP provides flow control at transport layer
- [x] b. UDP has no congestion control
- [ ] c. None of the choices
- [ ] d. TCP use source and destination MAC addresses to multiplex/demultiplex between applications.

Your answer is correct.

Question **33**

Correct

Marked out of 2.00

When a TCP sender receives an ACK segment from the receiver (a segment with a valid ACK field value *y*), what does it mean?

- (•) a. All bytes with sequence number up to (*y*-1) have arrived at the receiver successfully.
- ( ) b. Only the byte with sequence number (*y*-1) have arrived at the receiver successfully.
- ( ) c. All bytes with sequence number up to *y* have arrived at the receiver successfully.
- ( ) d. Only the byte with sequence number *y* have arrived at the receiver successfully.

Your answer is correct.

Question **34**

Correct

Marked out of 1.00

There is no carry in the calculation of the Internet checksum because it applies modulo-2 arithmetic.

Select one:

- True
- False

Your answer is correct.

Question **35**

Correct

Marked out of 3.00

Which of the following statements about BGP are correct?

- a. Routing policy plays a role in BGP routing.
- b. BGP routers exchange routing information over UDP.
- c. BGP uses multiple elimination rules in its route selection.
- d. BGP peers advertise routes to each other.

Your answer is correct.

Question **36**

Correct

Marked out of 1.00

Single parity check can correct one bit error.

Select one:

- True
- False

Your answer is correct.

Question **37**

Correct

Marked out of 2.00

Which of the following might happen in a congested network?

Select one or more:

- a. None of the choices
- b. Unnecessary retransmissions
- c. Large queueing delay
- d. Packets being dropped

Your answer is correct.

Question **38**

Correct

Marked out of 3.00

Given D = 101110, G = 1001, what are the redundancy bits (Frame Check Sequence) when we apply CRC codes for D?

- a. 010
- b. 011
- c. 100
- d. 001

Your answer is correct.

Question **39**

Correct

Marked out of 2.00

Which of the following statements are correct:

Select one or more:

- a. Checksum can be used to detect and correct bit errors in a transmitted packet
- b. Timer can be used to detect packet loss, but timeout can occur when a packet is just delayed but not lost
- c. Packets with duplicate sequence numbers allow the receiver to detect duplicate copies of a packet
- d. Go-Back-N protocol uses cumulative acknowledgements

Your answer is correct.

Question **40**

Correct

Marked out of 1.00

All CRC (Cyclic Redundancy Check) calculations are done in ones' complement arithmetic.

Select one:

- True
- False

Your answer is correct.

Question **41**

Correct

Marked out of 3.00

Which of the following statements about OSPF are correct?

- a. A network running OSPF can be hierarchically structured and there are different types of routers inside it.
- b. OSPF is a link-state protocol and used for intra-AS routing in the Internet.
- c. OSPF uses TCP as its underlying transport layer protocol.
- d. Multiple same-cost paths are allowed in OSPF.

Your answer is correct.

Question **42**

Complete

Marked out of 4.00

Please try to explain the **conditional GET** mechanism of HTTP.

The purpose of the conditional GET is so you don't send object if cache has up-to-date cached version cache

It specify date of cached copy in HTTP request "If-modified-since: <date> "

So in the server, response contains no object if the cached copy is up-to date:

- **in HTTP/1.0 304 Not Modified <data>**
- **in HTTP/1.0 200 OK <data>**

Comment:
not complete

Question **43**

Complete

Marked out of 4.00

Suppose you plan to develop a new network application which supports reliable data transfer between one sender and one receiver. Now you need to make a decision on which transport layer protocol to be used in your application, either UDP or TCP.

(1) Please make your choice and describe the reason for your choice.

(2) What if there is one sender and multiple receivers, does that change your answer?

1. To support reliable data transfer i'll use TCP as TCP provides point-to-point reliable data transfer, while UDP provides only its "best-effort" service This is because TCP is connection orientated thanks to its 3-way handshaking technique, while UDP is connectionless - each UDP

2. No

Comment:
not complete

Question **44**

Correct

Marked 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. every layer in the Open Systems Interconnection (OSI) model needs an error-detecting technique.
- c. even if it travels through the transmission medium perfectly, router memory could cause an error in the packet.
- d. this allows the packet to do Forward Error Correction (FEC) if there is a one bit error.

Your answer is correct.

Question **45**

Correct

Marked out of 2.00

Which field(s) is(are) **not** present in the IPv6 datagram header:

Select one or more:

- a. Version
- b. Source address
- c. Hop limit
- d. Internet checksum

Your answer is correct.