Started on	Friday, 15 October 2021, 12:50 PM
State	Finished
Completed on	Friday, 15 October 2021, 1:51 PM
Time taken	1 hour 1 min
Grade	**89.33** out of 100.00

Question **1**

Correct

Mark 1.33 out of 2.00

Select the items that apply to an autonomous system.

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. A set of routers that are owned by multiple organisations that in order to communicate use a common routing protocol.
- b. A set of routers that in order to stay fully connected have Ethernet cables directly connecting all hosts and routers.
- c. None of these. ✔
- d. A set of routers managed by a single organisation, and if it has a Autonomous System Number (ASN), it does not need to have a common routing protocol.

Your answer is correct.

Correct

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

Question **2**

Correct

Mark 2.00 out of 2.00

What is a benefit of a multi-homed Autonomous System (AS) that is not available in a non-multihomed (stub) AS?

Select one:

- a. Reduced fees for internet connection.
- b. Remain connected to the Internet even when one of the connections fails. ✔ Correct. An additional benefit besides improved fault tolerance is that having multiple connections also allows to better balance traffic load, e.g. by routing excess traffic to a certain destination through an alternative path if the primary path becomes overloaded.
- c. Being able to send your own traffic to other AS.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **3**

Correct

Mark 2.00 out of 2.00

Which of the following would be expected to own a transit AS?

Select one or more:

- [ ] a. Netflix
- [x] b. Verizon ✔
- [x] c. Vodafone ✔
- [ ] d. University of Auckland

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **4**

Correct

Mark 2.00 out of 2.00

Imagine a university that runs its own autonomous system (AS) and buys 100,000,000 GB of internet traffic from a single Internet service provider (ISP), which also runs its own AS, to supply to their students at a fixed charge of $5 per 50GB. What type of AS is the university?

Penalty regime: 33%, 66%, 100%

Select one:

- ( ) a. A multi-homed AS as it connects thousands of students.
- ( ) b. The university is not an AS as they are not an Internet Service Provider (ISP).
- (•) c. A stub AS, as it only has one connection with one ISP. ✔
- ( ) d. A transit AS as the students run peer-to-peer applications allowing traffic to pass between the students

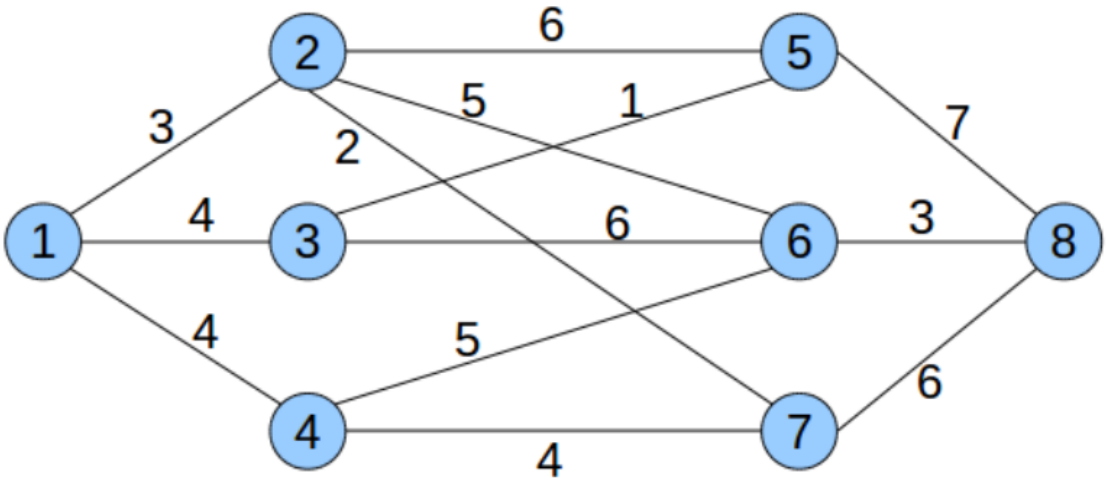
Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Information

The figure below shows a network topology, where the nodes are routers and the edges mark a link between nodes. The edges are weighted to show the cost of using the link. The following questions refer to this figure.



Question **5**

Correct

Mark 13.00 out of 13.00

Apply Dijkstra's algorithm on the example network shown at the top of the page to find the minimum cost routes from station 1 to all other stations. Please fill in the following table for the values during the calculation steps. S is the set of stations whose least-cost path is known; D(v) is the current cost of the path from the source (i.e., station 1) to station v; p(v) is the predecessor station along the path from the source to v, that is next to v.
Please use "inf" to specify an infinite cost and "-' to specify no predecessor.

Dijkstra Algorithm Results for station 1

Step	S	D(2), p(2)	D(3), p(3)	D(4), p(4)	D(5), p(5)	D(6), p(6)	D(7), p(7)	D(8), p(8)
0	{1}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	inf ✔ , - ✔	inf ✔ , - ✔	inf ✔ , - ✔	inf ✔ , - ✔
1	{12}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	9 ✔ , 2 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	inf ✔ , - ✔
2	{123}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	5 ✔ , 3 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	inf ✔ , - ✔
3	{1234}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	5 ✔ , 3 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	inf ✔ , - ✔
4	{12345}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	5 ✔ , 3 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	12 ✔ , 5 ✔
5	{123457}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	5 ✔ , 3 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	11 ✔ , 7 ✔
6	{1234576}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	5 ✔ , 3 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	11 ✔ , 7 ✔
7	{12345768}	3 ✔ , 1 ✔	4 ✔ , 1 ✔	4 ✔ , 1 ✔	5 ✔ , 3 ✔	8 ✔ , 2 ✔	5 ✔ , 2 ✔	11 ✔ , 7 ✔

Penalty regime: 100%

Correct

Marks for this submission: 13.00/13.00.

Question **6**

Correct

Mark 7.00 out of 7.00

With reference to the previous question, complete the forwarding table for station 1 after Dijkstra's algorithm has converged.

Destination	Next hop
2	2 ✔
3	3 ✔
4	4 ✔
5	3 ✔
6	2 ✔
7	2 ✔
8	2 ✔

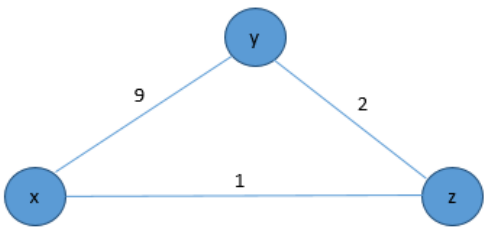
Penalty regime: 100%

Correct

Marks for this submission: 7.00/7.00.

Information

The figure below shows a simple 3-node network topology, where the nodes are routers and the edges mark a link between nodes. The edges are weighted to show the cost of using the link. The following questions refer to this figure.



Question **7**

Correct

Mark 9.00 out of 9.00

When the DV algorithm is applied to calculate the shortest-cost paths between any two nodes, every node keeps its routing table, consisting of its own distance vector and distance vectors received from its neighbours.

Please fill out the initial tables of every node; At time t0,

Node x's initial routing table is:

		Cost to		
		x	**y**	**z**
From	**x**	0 ✔	9 ✔	1 ✔
	y	inf	inf	inf
	z	inf	inf	inf

Node y's initial routing table is:

		Cost to		
		x	**y**	**z**
From	**x**	inf	inf	inf
	y	9 ✔	0 ✔	2 ✔
	z	inf	inf	inf

Node z's initial routing table is:

		Cost to		
		x	**y**	**z**
From	**x**	inf	inf	inf
	y	inf	inf	inf
	z	1 ✔	2 ✔	0 ✔

Penalty regime: 100% per cell

Correct

Marks for this submission: 9.00/9.00.

Question **8**

Correct

Mark 13.00 out of 15.00

Suppose at time t1, every node receives vectors from its two neighbours; then it updates its own distance vectors by the BF formula. **Please fill in the following blanks**;

For node x:

$D_x(x) = 0$;

$D_x(y) = \min\{c(x,y) + D_y(y), c(x,z) + D_z(y)\} = \min\{9+0, 1+2\}=$

3

✔ ;

$D_x(z) = \min\{c(x,z) + D_z(z), c(x,y) + D_y(z)\} = \min\{1+0, 9+2\} =$

1

✔ ;

Now x's routing table is as follows:

		Cost to		
		x	**y**	**z**
From	**x**	0 ✔	3 ✔	1 ✔
	y	9	0	2
	z	1	2	0

For node y:

$D_y(x) = \min\{c(y,x) + D_x(x), c(y,z) + D_z(x)\} =$

3

✔ ;

$D_y(y) = 0$;

$D_y(z) = \min\{c(y,z) + D_z(z), c(y,x) + D_x(z)\} =$

2

✔ ;

Now y's routing table is as follows:

		Cost to		
		x	**y**	**z**
From	**x**	0	9	1
	y	3 ✔	0 ✔	2 ✔
	z	1	2	0

For node z:

$D_z(x) = \min\{c(z,x) + D_x(x), c(z,y) + D_y(x)\} =$

1

✔ ;

$D_z(y) = \min\{c(z,y) + D_y(y), c(z,x) + D_x(y)\} =$

2

✔ ;

$D_z(z) = 0$;

Now z's routing table is as follows:

	Cost to		
	x	**y**	**z**

		Cost to		
		x	y	z
From	x	0	9	1
	y	9	0	2
	z	1 ✔	2 ✔	0 ✔

Correct

Marks for this submission: 15.00/15.00. Accounting for previous tries, this gives **13.00/15.00**.

Question **9**

Correct

Mark 1.00 out of 1.00

Which nodes have changed their distance vectors?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. None
- b. x ✔
- c. y ✔
- d. z

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

Question **10**

Correct

Mark 14.00 out of 15.00

Suppose at time t2 node x sends its vector to nodes y and z; node y sends its vector to nodes x and z;

After node x receives node y's vector, it updates its own vector as follows:

$D_x(x) = 0$;

$D_x(y) = \min\{c(x,y) + D_y(y), c(x,z) + D_z(y)\} =$

3

✔ ;

$D_x(z) = \min\{c(x,z) + D_z(z), c(x,y) + D_y(z)\} =$

1

✔ ;

Now x's routing table is as follows:

		Cost to		
		x	**y**	**z**
From	**x**	0 ✔	3 ✔	1 ✔
	y	3	0	2
	z	1	2	0

After node y receives node x's vector, it updates its own vector as follows:

$D_y(x) = \min\{c(y,x) + D_x(x), c(y,z) + D_z(x)\} =$

3

✔ ;

$D_y(y) = 0$;

$D_y(z) = \min\{c(y,z) + D_z(z), c(y,x) + D_x(z)\} =$

2

✔ ;

Now y's routing table is as follows:

		Cost to		
		x	**y**	**z**
From	**x**	0	3	1
	y	3 ✔	0 ✔	2 ✔
	z	1	2	0

After node z receives vectors from node x and y, it will update its own vector as follows:

$D_z(x) = \min\{c(z,x) + D_x(x), c(z,y) + D_y(x)\} =$

1

✔ ;

$D_z(y) = \min\{c(z,y) + D_y(y), c(z,x) + D_x(y)\} =$

2

✔ ;

$D_z(z) = 0$;

Now z's routing table is as follows:

		Cost to		
		x	**y**	**z**
From	**x**	0	3	1
	y	3	0	2

	Cost to		
	x	y	z
z	1 ✔	2 ✔	0 ✔

Correct

Marks for this submission: 15.00/15.00. Accounting for previous tries, this gives **14.00/15.00**.

Information

Alice sends the data block (99F3 FF27 E34F) to Bob, which is given in hexadecimal.

Please answer the next three questions using the description above.

Question **11**

Correct

Mark 3.00 out of 3.00

What is the partial sum on 99F3 and FF27? If there is a carry on the leftmost bit, please add it to the sum.

Please give the answer in hexadecimal without the leading '0x'.

(penalty regime: 50, 100 %)

Answer: 991B ✔

Correct

Marks for this submission: 3.00/3.00.

Question **12**

Correct

Mark 0.00 out of 5.00

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

Please give the answer in hexadecimal without the leading '0x'.

(penalty regime: 50, 100 %)

Answer: 7c6B ✔

Correct

Marks for this submission: 5.00/5.00. Accounting for previous tries, this gives **0.00/5.00**.

Question **13**

Correct

Mark 2.00 out of 2.00

What is the Internet checksum of the data block sent by Alice (i.e., the ones-complement operation on the result obtained in the previous question)?

Please give the answer in hexadecimal without the leading '0x'.

(penalty regime: 50, 100 %)

Answer: 8394 ✔

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 **14**

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 **15**

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 **16**

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 **17**

Correct

Mark 1.33 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. 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 **18**

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

Your answer is correct.

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, 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. 0 ✔
- c. 2
- d. 1

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **20**

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. 0
- b. 2 ✔
- c. 1
- d. 3 ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **21**

Correct

Mark 1.33 out of 2.00

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 sends back ACK2 and ACK3;
- b. B sends back ACK1;
- c. B ignores this frame and does nothing;
- d. B sends back 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 **22**

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

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **23**

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 frame(s) will be re-transmitted on timeout at A?

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. 0
- b. 1 ✔
- c. 2
- d. 3

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **24**

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. 0
- b. 2 ✔
- c. 1 ✔
- d. 3 ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

◄ Quiz: Error Detection, Correction, and Control Problems (practice copy)

Jump to...

Superquiz (RDT protocols) ►