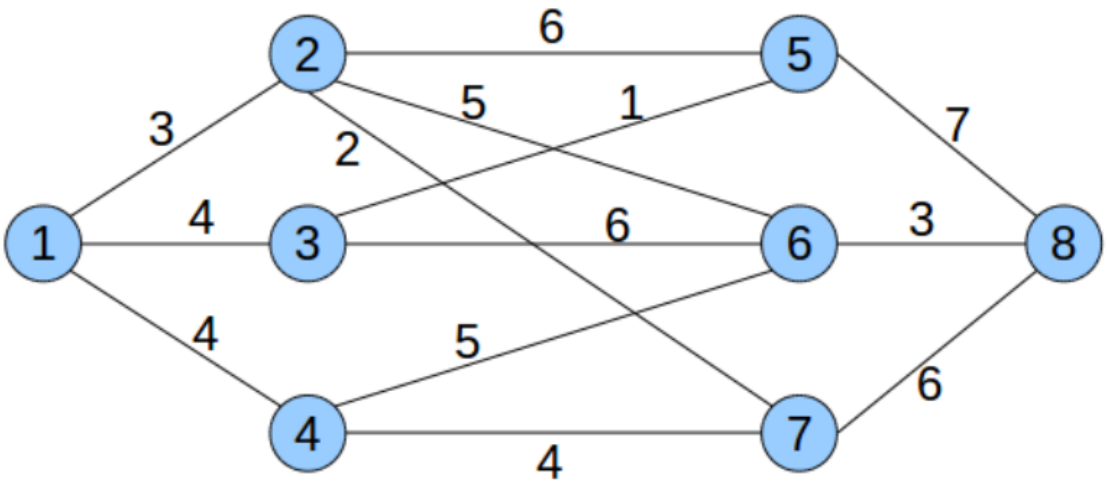
Started on	Tuesday, 28 September 2021, 6:27 PM
State	Finished
Completed on	Wednesday, 29 September 2021, 4:31 PM
Time taken	22 hours 4 mins
Marks	98.67/100.00
Grade	**9.87** out of 10.00 (**99**%)

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 **1**

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 **2**

Correct

Mark 5.00 out of 5.00

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: 5.00/5.00.

Question **3**

Correct

Mark 4.00 out of 4.00

Is Dijkstra's algorithm link-state or distance-vector routing?

Penalty regime: 100%

Select one:

- a. Distance-vector routing.
- b. Link-state routing. ✔

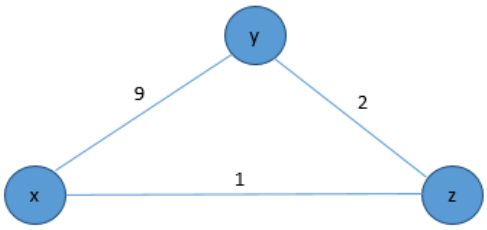
Your answer is correct.

Correct

Marks for this submission: 4.00/4.00.

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 **4**

Correct

Mark 6.00 out of 6.00

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: 6.00/6.00.

Question **5**

Correct

Mark 6.00 out of 6.00

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: 6.00/6.00.

Question **6**

Correct

Mark 3.00 out of 3.00

Which nodes have changed their distance vectors?

Penalty regime: 33%, 66%, 100%

Select one or more:

- [x] a. y ✔
- [ ] b. None
- [ ] c. z
- [x] d. x ✔

Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.

Question **7**

Correct

Mark 6.00 out of 6.00

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: 6.00/6.00.

Question **8**

Correct

Mark 2.00 out of 2.00

Which of the following link cost changes could cause a routing loop which leads to the count-to-infinity problem in the DV algorithm?

Penalty regime: 33%, 66%, 100%

Select one:

- a. when a link cost decreases
- b. whenever there is a link cost change
- c. when a link cost increases ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **9**

Correct

Mark 5.00 out of 5.00

Select the items that apply to an autonomous system.

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. A set of routers that in order to stay fully connected have Ethernet cables directly connecting all hosts and routers.
- b. A set of routers that are owned by multiple organisations that in order to communicate use a common routing protocol.
- 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: 5.00/5.00.

Question **10**

Correct

Mark 5.00 out of 5.00

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

Your answer is correct.

Correct

Marks for this submission: 5.00/5.00.

Question **11**

Correct

Mark 5.00 out of 5.00

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. Being able to send your own traffic to other AS.
- c. 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.

Your answer is correct.

Correct

Marks for this submission: 5.00/5.00.

Question **12**

Correct

Mark 5.00 out of 5.00

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

Select one or more:

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

Your answer is correct.

Correct

Marks for this submission: 5.00/5.00.

Question **13**

Correct

Mark 2.00 out of 2.00

A packet arrives at a router, the router performs a table lookup to discover where to send it. This is:

Penalty regime: 33%, 66%, 100%

Select one:

- (•) a. *Forwarding* as this decision applies to only this packet. ✔
- ( ) b. *Routing* as this decision has a lot of latency.
- ( ) c. Neither.
- ( ) d. *Routing* as a table is consulted.

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **14**

Correct

Mark 4.00 out of 4.00

Match up the terminology with the correct definitions. AS = Autonomous System.

Penalty regime: 100%

Intra-AS routing is: routing within an AS ✔

Inter-AS routing is: routing from one AS to another AS ✔

Your answer is correct.

Correct

Marks for this submission: 4.00/4.00.

Question **15**

Correct

Mark 4.00 out of 4.00

A router operates a routing protocol that collects knowledge required for routing from only adjacent routers. Select the items that are true for this routing protocol.

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. Dynamic (adaptive) routing. ✔
- b. Global (centralized) routing.
- c. Decentralized routing. ✔
- d. Static routing.

Your answer is correct.

Correct

Marks for this submission: 4.00/4.00.

Question **16**

Correct

Mark 4.00 out of 4.00

Suppose we have a network whose routers have a low processing and/or low memory capacity. What would be the best type of routing protocol?

Penalty regime: 100%

Select one:

- a. Link-state (Dijkstra's algorithm)
- b. Distance-vector (Bellman-Ford) ✔

Your answer is correct.

Correct

Marks for this submission: 4.00/4.00.

Question **17**

Correct

Mark 2.00 out of 2.00

Suppose we have a large network of routers (greater than 1000). What would be the best type of routing protocol and why?

Penalty regime: 33%, 66%, 100%

Select one:

- a. Link-state, because having the full topology allows faster recovery from link/node failure.
- b. Distance-vector, because link failure has fast convergence over the network.
- c. Distance-vector, because information is shared only among neighbors.
- d. Link-state with hierarchy, because this creates smaller networks. ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **18**

Correct

Mark 5.00 out of 5.00

With respect to distance-vector routing algorithms, what is the count to infinity problem?

Penalty regime: 33%, 66%, 100%

Select one:

- a. Routers more than 10 hops away are considered infinitely away and are isolated from the rest of the network
- b. After link cost increases, it could take a very long time for the algorithm to converge. ✔
- c. Routers cannot count higher than 2^5 and so cannot count to infinity.
- d. After a new path is found in the network, it takes a very long (infinite) time for other routers to learn about the new route.

Your answer is correct.

Correct

Marks for this submission: 5.00/5.00.

Question **19**

Correct

Mark 2.67 out of 4.00

Routing Information Protocol (RIP) is limited to small networks because:

Penalty regime: 33%, 66%, 100%

Select one or more:

- a. RIP can not adapt to link cost change or errors such as failed links or routers.
- b. RIP has a large convergence time in large networks. ✔
- c. None of these reasons.
- d. RIP does not consider the count to infinity problem.
- e. Every router and host can be no more than 15 hops away. ✔

Your answer is correct.

Correct

Marks for this submission: 4.00/4.00. Accounting for previous tries, this gives **2.67/4.00**.

Question **20**

Correct

Mark 4.00 out of 4.00

What are the benefits of using NAT (Network Address Translation)?

Penalty: 33%, 66%, 100%;

Select one or more:

- a. Devices inside the local network are not explicitly addressable by outside world. ✔
- b. Local network can change addresses of devices inside without notifying outside world. ✔
- c. Local network uses just one IP address as far as outside world is concerned. ✔
- d. Local network can change ISP without changing addresses of devices inside. ✔

Your answer is correct.

Correct

Marks for this submission: 4.00/4.00.

Question **21**

Correct

Mark 2.00 out of 2.00

What is the size of IP addresses in IPv6?

Penalty regime: 33%, 66%, 100%

Select one:

- a. 64 bits
- b. 32 bits
- c. 256 bits
- d. 128 bits ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **22**

Correct

Mark 2.00 out of 2.00

OSPF is a link-state protocol and it runs:

Penalty regime: 33%, 66%, 100%

Select one:

- a. Distance-Vector routing algorithm
- b. Dijkstra algorithm ✔
- c. Prim's algorithm
- d. Bellman-Ford algorithm

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

Question **23**

Correct

Mark 2.00 out of 2.00

BGP (Border Gateway Protocol) is an:

Penalty regime: 33%, 66%, 100%

Select one:

- a. Intra-AS routing protocol
- b. Inter-AS routing protocol ✔

Your answer is correct.

Correct

Marks for this submission: 2.00/2.00.

◄ Quiz: IPv4 Networking (practice copy)

Jump to...

Quiz: Error Detection, Correction, and Control Problems ►