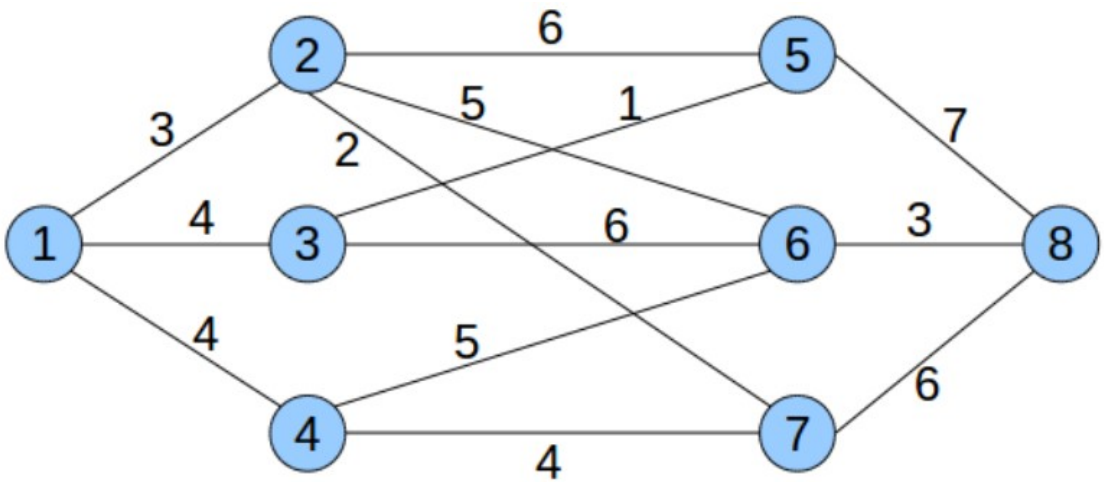
| | |
|---|---|
| **Started on** | Sunday, 20 September 2020, 10:11 AM |
| **State** | Finished |
| **Completed on** | Sunday, 20 September 2020, 5:36 PM |
| **Time taken** | 7 hours 24 mins |
| **Marks** | 81.67/100.00 |
| **Grade** | **8.17** out of 10.00 (**82**%) |

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

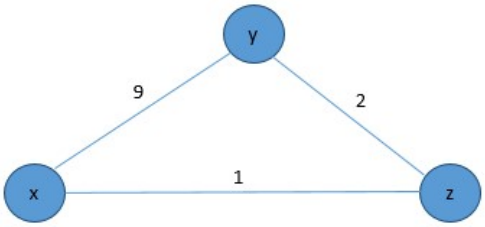
Your answer is correct.

**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** |
| **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:

- a. None
- b. y ✔
- c. x ✔
- d. z

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 |
| | **z** | 1 ✔ | 2 ✔ | 0 ✔ |

**Correct**

Marks for this submission: 6.00/6.00.

Question **8**

Correct

Mark 1.33 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. whenever there is a link cost change
- b. when a link cost decreases
- c. when a link cost increases ✔

Your answer is correct.

**Correct**

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

Question **9**

Correct

Mark 3.33 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. 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.
- d. None of these. ✔

Your answer is correct.

**Correct**

Marks for this submission: 5.00/5.00. Accounting for previous tries, this gives **3.33/5.00**.

Question **10**

Correct

Mark 1.67 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 multi-homed AS as it connects thousands of students.
- b. A stub AS, as it only has one connection with one ISP. ✔
- c. A transit AS as the students run peer-to-peer applications allowing traffic to pass between the students
- d. The university is not an AS as they are not an Internet Service Provider (ISP).

Your answer is correct.

**Correct**

Marks for this submission: 5.00/5.00. Accounting for previous tries, this gives **1.67/5.00**.

Question **11**

Correct

Mark 1.67 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. 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: 5.00/5.00. Accounting for previous tries, this gives **1.67/5.00**.

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:

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

Your answer is correct.

**Correct**

Marks for this submission: 2.00/2.00.

Question **14**

Correct

Mark 0.00 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. Accounting for previous tries, this gives **0.00/4.00**.

Question **15**

Correct

Mark 2.67 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. Decentralized routing. ✔
- ☐ b. Global (centralized) routing.
- ☐ c. Static routing.
- ☑ d. Dynamic (adaptive) routing. ✔

Your answer is correct.

**Correct**

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

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

Your answer is correct.

**Correct**

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

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 cannot count higher than 2^5 and so cannot count to infinity.
- b. After link cost increases, it could take a very long time for the algorithm to converge. ✔
- c. Routers more than 10 hops away are considered infinitely away and are isolated from the rest of the network
- 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 2.00 out of 4.00

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

Penalty regime: 33%, 66%, 100%

Select one or more:

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

Your answer is correct.

**Correct**

Marks for this submission: 4.00/4.00. Accounting for previous tries, this gives **2.00/4.00**.

Question **20**

Correct

Mark 2.67 out of 4.00

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

Penalty: 33%, 66%, 100%;

Select one or more:

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

Your answer is correct.

**Correct**

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

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. 128 bits ✔
- b. 32 bits
- c. 64 bits
- d. 256 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. Dijkstra algorithm ✔
- b. Prim's algorithm
- c. Distance-Vector routing 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

Jump to...

Quiz: Error Detection, Correction, and Control Problems ►