1. Suppose a 1500-byte datagram were to be sent over a link with an MTU size of 296. We define IP control overhead as the ratio of control information you add as IP header(s) to the IP payload length. What is IP overhead associated with all the fragments in percentage?

A) 8% B) 10% C) 12% D) 14%

Answer:(A)
Explanation:

Data = 1500 bytes
MTU = 296 - 20 = 276 bytes
No. of fragmentation = ceil(1500 / 276) = 6

Totai IP overhead = 6 x 20 = 120 bytes
So percentage of total overhead = (120/1500) x 100 = 8%

2. An IP(v4) datagram received by an intermediate router, whose total length is 1500 bytes, HLEN value is $(10)_2$, and the MTU of the Forwarding link is 200 bytes. What is the total number of fragments and offset value of the last fragment?

A) 8, 168 B) 7, 144

C) 6, 120 D) 9, 200

Answer:(A)
Explanation:
IP packet size=1500
HLEN=$(10)_2$= 2, Actual Header size = 2 x 4 =8 bytes
Data in IP packet =1500 - 8(header) = 1492
MTU =200, Data transfer limit = 200 - 8 = 192 (since 192 is a multiple of 8, it's appropriate)
So, fragments will be like - 192(data) +8(header)
To transfer data of 1492 bytes of IP packet, we will need #fragments = ceil(1492/192)=8
1st fragment-192 +8, Frag. Offset=0
2nd fragment-192 +8, Frag. Offset=24
3rd fragment-192 +8, Frag. Offset=48
4th fragment-192 +8, Frag. Offset=72
5th fragment-192 +8, Frag. Offset=96
6th fragment-192 +8, Frag. Offset=120
7th fragment-192 +8, Frag. Offset=144
8th fragment-148 +8, Frag. Offset=168

3. Consider a message of size 1000 bytes, the IP header is 20 bytes, and the Maximum transferable unit is 256 bytes. The packet ID is 25. The fragment offset value in the fourth packet(fragment) is ____.

A) 87 B) 58 C) 29 D) 18

Answer:(A)
Explanation:
Data = 1000
MTU = 256, Data transfer limit = 256 - 20 = 236 (since 236 is not a multiple of 8, so 232 is appropriate)
So, fragments will be like - 232(data) + 20(header)
To transfer data of 100 bytes of IP packet, we will need #fragments = ceil(1000/232)=5
1st fragment-232 + 20, Frag. Offset=0
2nd fragment-232 + 20, Frag. Offset=29
3rd fragment-232 + 20, Frag. Offset=58
4th fragment-232 + 20, Frag. Offset=87
5th fragment-72 + 20, Frag. Offset=116

4. A packet has arrived with an MF(More fragments) bit value of 0. Is this the first fragment, the last fragment, or a middle fragment?

A) First fragment B) Last fragment

C) Middle fragment D) More information required

Answer:(D)
Explanation:
If the M bit is 0, it means this can be the No fragment or Last fragment
we need more information (the value of the fragmentation offset).
MF= 0 Offset= 0 -> No fragment
MF= 0 Offset= !0 -> Last fragment
MF= 1 Offset= 0 -> First fragment
MF= 1 Offset= !0 -> Middle fragment

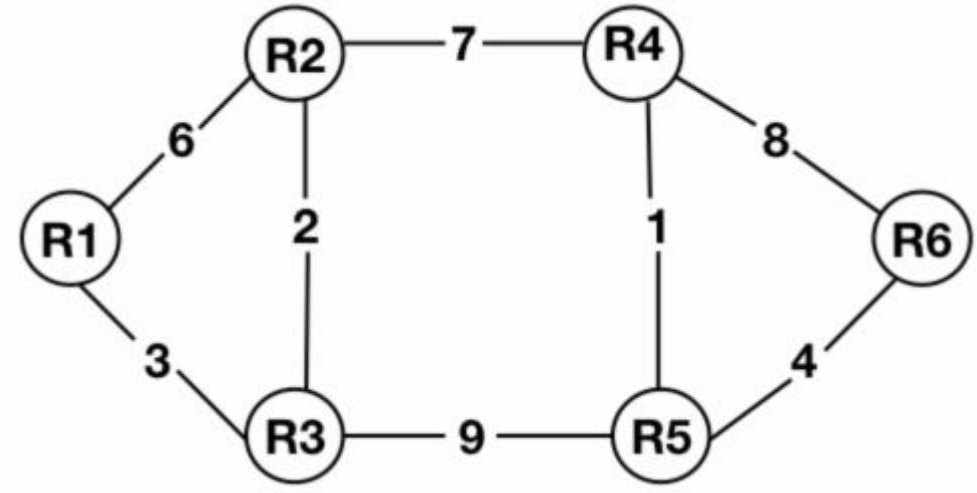
5. Two popular routing algorithms are Distance Vector(DV) and Link State (LS) routing. Which of the following is/are true? [MSQ]

A. **Count to infinity is a problem only with DV and not LS routing**
B. In LS, the shortest path algorithm is run only at one node
C. In DV, the shortest path algorithm is run only at one node
D. **DV requires a lesser number of network messages than LS**

Answer:(A,D)
Explanation:

True, Count to infinity is a problem associated with the Distance Vector algorithm and does not affect the Link State routing algorithm.
False, In the LV algorithm, the shortest path algorithm is run on every node after each node has broadcasted information about its neighbours.
False, In DV, the shortest path algorithm is run at each node simultaneously whenever it receives any distance vectors or whenever any link cost changes.
True, In LV, each node sends neighbouring information to all nodes, whereas in DV, a node broadcasts only its Distance Vector, so DV requires fewer network messages.

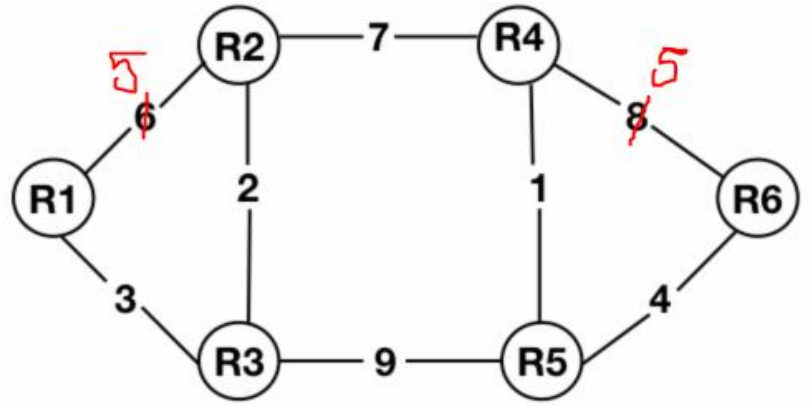
6. Consider a network with 6 routers R1 to R6 connected with links having weights, as shown in the following diagram.



All the routers use the distance vector-based routing algorithm to update their routing tables. Each router starts with its routing table initialized to contain an entry for each neighbour with the weight of the respective connecting link. After all the routing tables stabilize, how many links in the network will never be used to carry any data? _____ **[NTA]**

Answer:(2)
Explanation:

Intuitively finding the shortest paths between the nodes and if there is any path with lesser cost than the cost in the initial state, then such paths will never be used.
So, if we find the shortest paths, we find

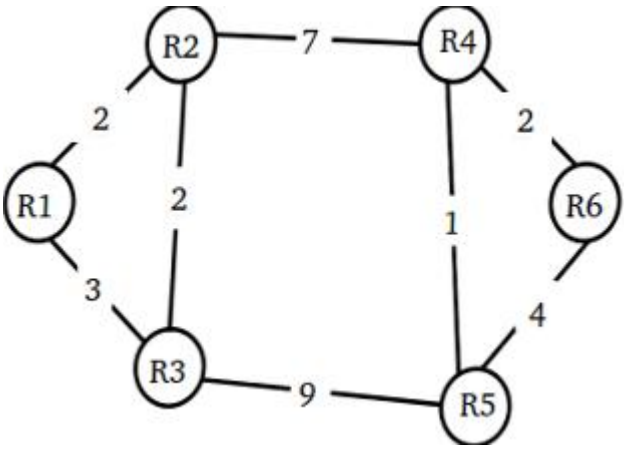


So R1→ R2 and R4 → R6 paths are never used because there are alternative paths here: R1→ R3→ R2 in cost of 5 And R4→ R5→ R6 in cost of 5

7. Consider the data given in the above question. Suppose the weights of all unused links in the previous question are changed to 2, and the distance vector algorithm is used again until all routing tables stabilize. How many links will now remain unused?

A. 0 B. **1** C. 2 D. 3

Answer:(B)
Explanation:



If the path from R1→ R2 is changed to weight 2 And R4→ R6 weight to 2

Because of this, the R5→ R6 path might not be used as there is no path from
R5→ R4→ R6 in just weight 3 rather than 4.

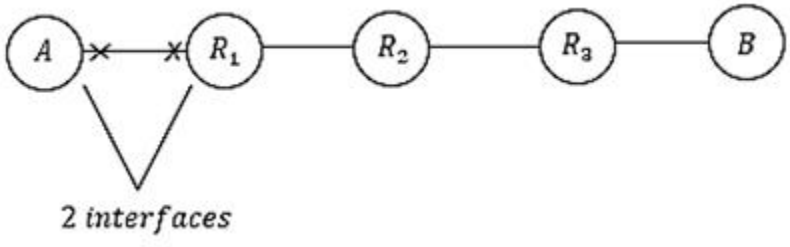
So, the R5→ R6 path will not be used.

8. Consider two hosts, A and B. It is given that there are 3 routers between A and B. If an IP datagram is sent from host A to host B, what will the number of interfaces over which the datagram will travel? Also, how many routing tables will be indexed to send the datagram from A to B?

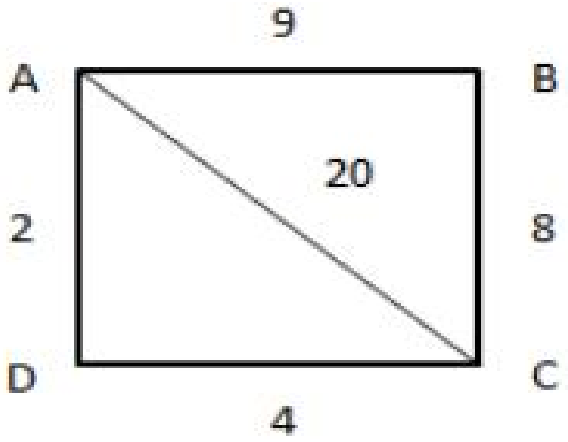
A) 8 interfaces, 3 routing tables
B) 4 interfaces, 3 routing tables
C) 4 interfaces, 5 routing tables
D) 8 interfaces, 5 routing tables

Answer:(A)
Explanation:

There are two interfaces between A and R1. as shown in the image. Here, Interface means both sides of the physical connection port.
You can see that there are two interfaces for each host.
So there is 4 x 2 = 8 interface



9. For the given graph, if the numbers associated with each edge are weights of the links, and if DVR is used, what is the routing table at 'C' after the tables are stabilized?



A

To	NH	Dist
A	20	A
B	8	B
C	0	C
D	4	D

B

To	NH	Dist
A	6	D
B	8	B
C	0	C
D	4	D

C

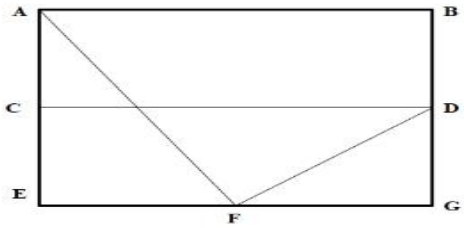
To	NH	Dist
A	20	A
B	8	D
C	0	C
D	4	D

D

To	NH	Dist
A	20	A
B	8	B
C	0	C
D	4	D

Answer:(B)
Explanation: Apply the DVR algorithm

10. For the network in the figure below, the routing table of the nodes A, E, D and G are shown. Suppose that F has estimated its delay to its neighbours A, E, D, and G as 8, 10, 12, and 6 msec, respectively, and update its routing table distance vector routing technique. Which one of the following options represents the updated routing table of F?



Routing Tables:

A -

A	0
B	40
C	14
D	17
E	21
F	9
G	24

E -

A	24
B	27
C	7
D	2
E	0
F	11
g	22

D-

A	20
B	8
C	30
D	0
E	14
F	7
G	22

G-

A	21
B	24
C	22
D	19
E	22
F	10
G	0

A

A	8
B	20
C	17
D	12
E	10
F	0
G	6

B

A	21
B	8
C	7
D	19
E	14
F	0
G	22

C

A	8
B	20
C	17
D	12
E	10
F	16
G	6

D

A	8
B	8
C	7
D	12
E	10
F	0
G	6

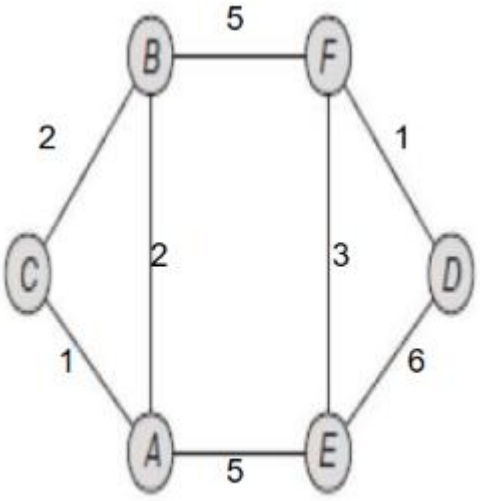
Answer:(A)

Explanation: Take the minimum of each row.

A	8
B	20
C	17
D	12
E	10
F	0
G	6

	A+8	E+10	D+12	G+6	At F	NEXT HOP
A	0+8=8	24+10=34	20+12=32	21+6=27	**8**	**A**
B	40+8=48	27+10=37	8+12=20	24+6=30	**20**	**D**
C	14+8=22	7+10=17	30+12=42	22+6=28	**17**	**E**
D	17+8=25	2+10=12	0+12=12	19+6=25	**12**	**D**
E	21+8=29	0+10=10	14+12=26	22+6=28	**10**	**E**
F	9+8=17	11+10=11	7+12=19	10+6=16	**0**	**-**
G	24+8=32	22+10=32	22+12=34	0+6=6	**6**	**G**

11. The subnet with 6 routers with delays is shown as a line in the following graph. It uses distance-vector routing to build the tables. Router A has measured its routes to neighbours B, C, and E. It gets a new distance of 2, 1, and 5 for B, C, E, respectively. A has received the following vectors from node B: (2,0,2,6,6,5), from node C: (1,4,0,9,7,7) and from node E: (6,8,7,5,0,3). Find which of the following is the new routing table at A.



A

To	Next hop	Distance
A	-	0
B	B	2
C	C	1
D	E	6
E	E	5
F	B	5

B

To	Next hop	Distance
A	-	0
B	B	2
C	C	1
D	E	6
E	E	5
F	B	7

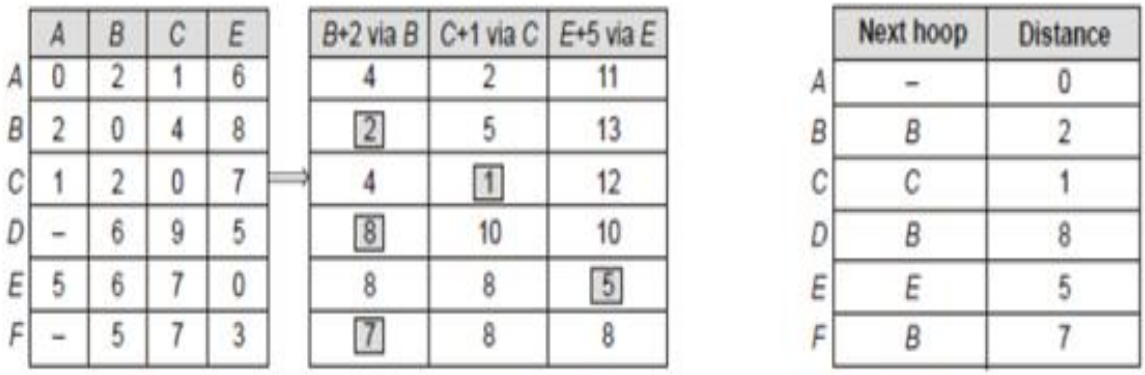
C

To	Next hop	Distance
A	-	0
B	B	2
C	C	1
D	B	5
E	E	5
F	B	7

D

To	Next hop	Distance
A	-	0
B	B	2
C	C	1
D	B	8
E	E	5
F	B	7

Answer(D):
Explanation:



	A	B	C	E	B+2 via B	C+1 via C	E+5 via E
A	0	2	1	6	4	2	11
B	2	0	4	8	[2]	5	13
C	1	2	0	7	4	[1]	12
D	–	6	9	5	[8]	10	10
E	5	6	7	0	8	8	[5]
F	–	5	7	3	[7]	8	8

	Next hoop	Distance
A	–	0
B	B	2
C	C	1
D	B	8
E	E	5
F	B	7

12. Which properties are/ are False about following the Routing Algorithm? [MSQ]

A) In Static Routing, everything is set up manually & requires administration, and In Dynamic Routing, everything is done by routers Automatically.
B) Static Routing works when traffic is predictable & network is simple, and Dynamic Routing calculates routes based on received updated network state information.
C) Static Routing and Dynamic Routing, which adapt to changes depending on traffic and topology.
D) LSR is a Static routing algorithm, and DVR is the Dynamic routing algorithm

Answer:(C,D)
Explanation:

A- TRUE - Static Routing is set up manually and requires administration, and In Dynamic Routing, everything is done by routers Automatically.
B- TRUE - Static Routing works when traffic is predictable & network is simple, and Dynamic Routing calculates routes based on received updated network state information.
C- FALSE - Static Routing does not change based on network traffic and topology, But Dynamic Routing does change depending on network traffic and topology.
D- FALSE - LSR and DVR both are Dynamic routing algorithm

13. Which statements about routing and flooding methods are correct? [MSQ]

A) In the Routing method, there is a Routing Table that is a disadvantage compared to the flooding method.

B) In the routing method, reliability is low, and reliability is high in the flooding method.

C) In the Routing method, There is no duplicate packet, but in the flooding method, there are duplicate packets.

D) In the Routing method, Traffic is low, but in the flooding method, traffic is high.

Answer:(A,B,C,D)
Explanation:

A- TRUE - In the Routing method, the Routing Table is a disadvantage compared to the flooding method.
B- TRUE - In the routing method, reliability is low, and in the flooding method, reliability is high.
C- TRUE - In the Routing method, There is no duplicate packet, but in the flooding method, there are duplicate packets.
D- TRUE - In the Routing method, Traffic is low, but in the flooding method, traffic is high.

14. Two popular routing algorithms are Distance Vector routing (DVR) and Link State Routing (LSR) routing. Which of the following is true? [MSQ]

A) Count-to-infinity is a problem only with DVR, not in LSR.

B) In LSR, the shortest path algorithm is run only at one node.

C) In DVR, the shortest path algorithm runs only at one node.

D) DVR requires a lesser number of messages than LSR.

Answer:(A,D)
Explanation:
A- True - Count-to-infinity is a problem only with DVR, not in LSR.
B- False - In LSR, the shortest path algorithm is run only at one node.
C- False - In DVR, the shortest path algorithm runs only at one node.
D- True - DVR requires fewer messages than LSR.

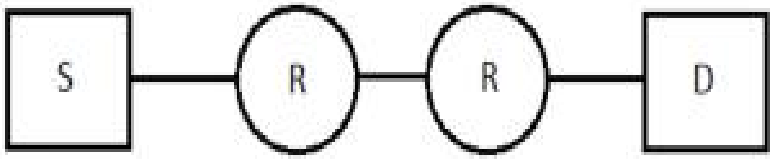
15. Assume that source S and destination D are connected through two intermediate routers labelled R. Determine how many times each packet has to visit the network layer and the data link layer during transmission from S to D.

A) Network layer – 4 times and Data link layer – 4 times

B) Network layer – 4 times and Data link layer – 3 times

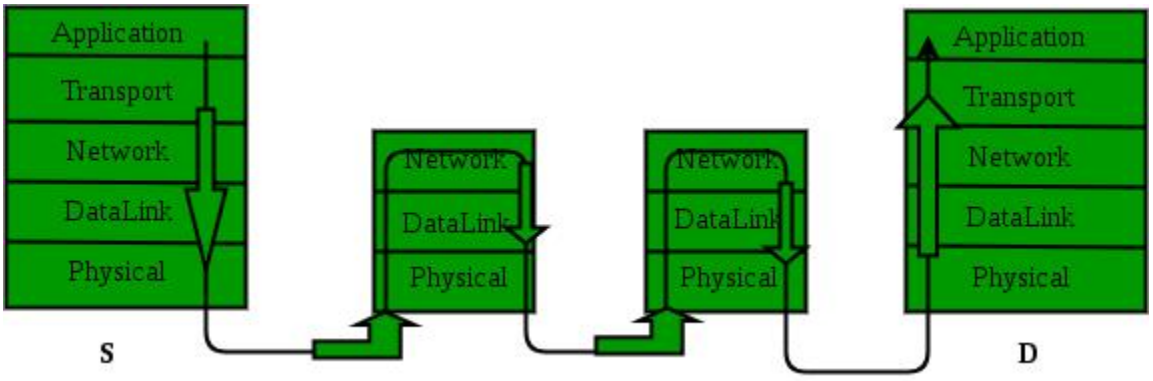
C) Network layer – 4 times and Data link layer – 6 times

D) Network layer – 2 times and Data link layer – 6 times



Answer:(C)
Explanation:

Network layer – 4 times and Data link layer – 6 times



Every packet passes twice through the data link layer of every intermediate router.