Computer Network Final Exam (January 13th, 2021)

1. (10%, Link State) Consider the network shown in Figure 1. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from u to all network nodes. Show how the algorithm works by computing a table.
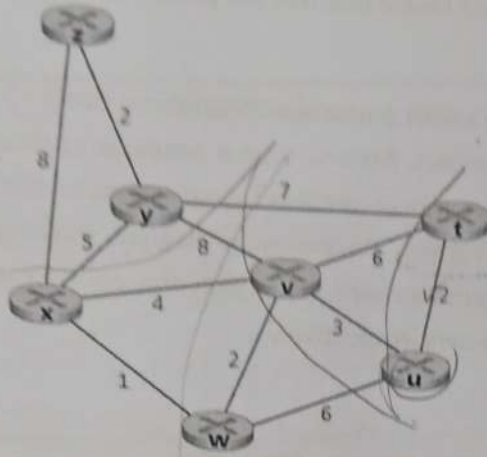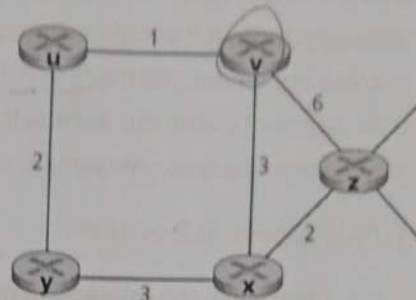

Figure 1.   A netwrok with 7 nodes

Figure 2.

2. (25%, Distance Vector)

   a. (15%) Consider the network shown in Figure 2, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node v.

   b. (10%) Please briefly describe the "count-to-infinity" problem. Does the solution, "Poisoned Reverse", completely solve the problem? Why or why not?

3. (10%) Consider a router that interconnects three subnets: Subnet 1, Subnet 2, Subnet 3, and Subnet 4. Suppose all of the interfaces in each of these three subnets are required to have the prefix 196.2.16/24. Also suppose that Subnet 1 is required to support up to 128 interfaces, Subnets 2 is required to support up 41 interfaces, Subnet 3 are each required to support up to 40 interfaces, and Subnet 4 are each required to support up to 39 interfaces. Provide three network address (of the form a.b.c/x) that satisfy these constraints.

4. (5%) Is it necessary that every autonomous system use the same intra-AS routing algorithm? Why or why not?

5. (5%) Please briefly describe the NAT traversal problem and one of its possible solutions.

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6. (5%) Please elaborate on the relationship between hierarchical addressing and route aggregation.

7. (5%) In our rdt protocols, why did we need to introduce sequence numbers?

8. (5%) In our rdt protocols, why did we need to introduce timers?

9. (10%) What is Stop-and-Wait operation? Please describe the performance issue for this operation?

10. (10%) Suppose Host A and Host B use a GBN protocol with windows size N = 3 and a long-enough range of sequence numbers. Assume Host A sends six application messages to Host B and that all messages are correctly received, except for the first acknowledgement and the fifth data segment. Draw a timing diagram, showing the data segments and the acknowledgements sent along with the corresponding sequence and acknowledgement numbers, respectively.

11. (10%) Fairness: TCP vs. UDP

    a. Please use the following figure to explain why TCP is fair.

    b. Does the fairness still hold in the Internet when TCP coexists with UDP? Why or why not?

Connection 1 throughput   R