Homework 4: Routing Algorithms and Subnet

CSE 4/589 - Modern Networking Concepts
Instructor: Yaxiong Xie

NOTES:

- **Academic integrity**: Print the following statement at the very beginning of your homework file: "*I have read and understood the course academic integrity policy in the syllabus of the class. I confirm that the work presented in this report is my own. Where information has been derived from other sources, I confirm that this has been indicated in the report.*" Your homework will NOT be graded if you didn't print the sentence.
- For the calculation, you need to write down how the results are derived and your final answer also should be correct to obtain the credits for that question. Please state any assumptions you are making while answering a question.
- Submit the homework through UBLearns as PDF files.

Instructions

- Show all necessary steps for calculations.
- Submit electronically in PDF format.

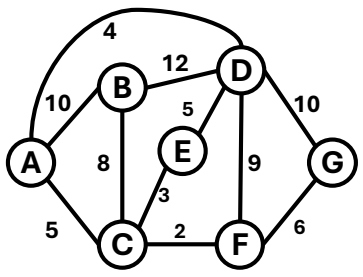
Problem 1: Subnet Division

An organization has been assigned the network 172.16.0.0/16 and needs to create 8 subnets with approximately equal numbers of hosts.

1. What subnet mask of this network? [10 points]
2. What's the network address (CIDR format) of the 8 subnets. [10 points]
3. How many hosts can each subnet support? [10 points]

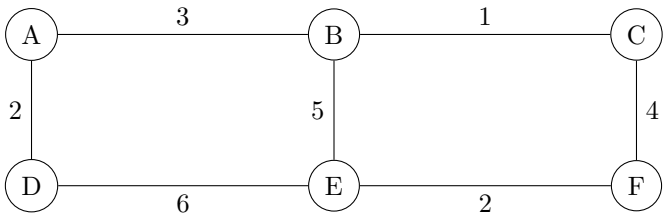
Problem 2: Dijkstra's Algorithm

[30 points] We have a network with the topology shown in the diagram below. This network consists of seven nodes (labeled A through G), and the diagram indicates the costs associated with the links between neighboring nodes. Use Dijkstra's link-state routing algorithm to determine the shortest paths from node A to all other nodes in the network. For each destination node, provide the next hop that a packet would take from node A to reach that destination, and the overall cost of the shortest path.



Problem 3: Distance Vector Routing [40 points]

Consider the following network topology with the link costs as indicated:



a) Initialize the distance vector tables for each node with direct neighbors only. [10 points]

b) Using the Distance Vector algorithm, show the tables after each iteration until the algorithm converges. Assume all updates are synchronized (all nodes update simultaneously). [30 points]

For each iteration, show:

- The updated distance vector table for each node
- The routing decisions made at each node
- Any changes in next-hop selections