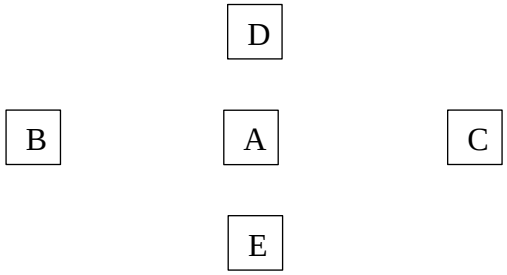
Problem Set 3
Points for each problem as indicated: Total of 100 points
Turn in before class on March 25, 2025

1. (10 pts) Consider 5 wireless stations, A, B, C, D and E. Station A can send to / receive from all other stations. B can send to / receive from D, A and E. C can send to / receive from D, A and E. D can send to / receive from B, A and C. E can send to / receive from B, A and C. See figure below.



   a. When A is transmitting to B, what other transmissions are possible?
   b. When B is transmitting to A, what other transmissions are possible?
   c. When B is transmitting to D, what other transmissions are possible?

2. (10 pts) The following protocol problems relate to wireless LAN communication.
   a. Explain with an example how MACA can solve the hidden terminal problem.
   b. Explain with an example how MACA can solve the exposed terminal problem.

3. (10 pts) Consider the three-way handshake used in a TCP connection setup. Suppose that an old SYN segment from station A arrives at station B, requesting a TCP connection. Explain how the three-way handshake procedure ensures that the connection is rejected. Now suppose that an old SYN segment from station A arrives at station B followed a bit later by an old ACK segment from A to a SYN segment from B. Is this connection also rejected? Explain.

4. (15 pts) A large number of consecutive IP addresses are available starting at 190.16.0.0.
   a. Viewing this as a class-based address, what class of network is this. How many hosts can it support? Explain
   b. Consider the addresses available as all those in (a). What is the CIDR network address (in w.x.y.z/s notation) for the available address space?
   c. Suppose that four organizations A, B, C, D have requested 4096, 2048, 8092, and 1024 addresses respectively and in that order. For each of these organizations, give the network address assigned in w.x.y.z/s notation. Show your work.

5. (10 pts) Suppose a router receives an IP packet containing 500 data bytes and has to forward the packet to a network with an MTU of 200 bytes. Assuming an IP header of 20 bytes, show the fragments the router creates and specify the relevant values in each fragment header (total length, fragment offset, and more bit).

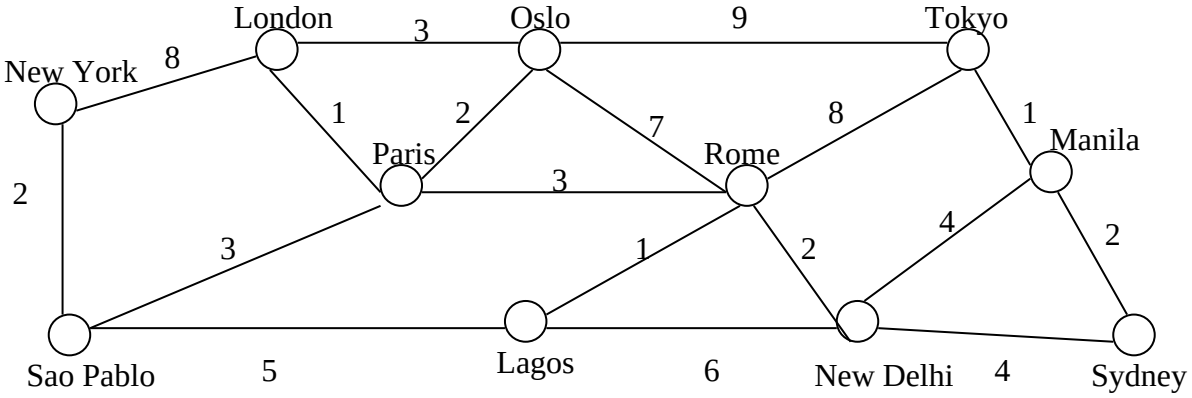
6. (15 pts) A router has the following CIDR entries in its routing table.

Address / Mask	Next Hop
135.46.56.0/21	A
135.46.58.0/23	B
192.53.40.0/23	C
default	D

For each of the following packet destination IP addresses, where does the router send the packet at the next hop?

135.46.57.10
135.46.59.2
135.46.60.7
135.46.120.86
192.53.3.7

7. (15 pts) Consider the graph in the figure below: use Dijkstra's algorithm to find the shortest paths and distances from Rome to all the other cities. Show your work and list the cities in alphabetical order.



8. (15) Using the same graph as in the figure of problem 7, use the D'Esopo Pape version of the Bellman Ford Moore algorithm to find the shortest paths and distances from Oslo to all the other cities. When you consider neighbor nodes, do so in alphabetical order.