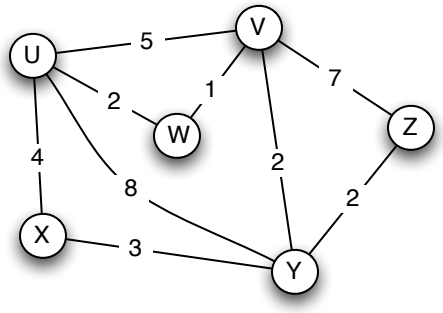
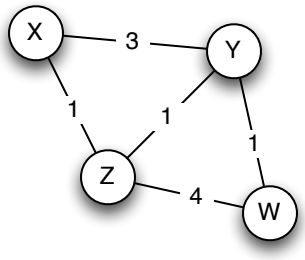
1. Given a data segment consisting of 1 0 0 1 1 1 0 1 1 1 0 1 0 0 1 1 1 0 1 0 1 0 0 1 0, calculate the optimal 2-dimensional parity. You *must* show your work (i.e., draw out the table!).

2. Calculate the correct CRC bits for the data segment: 1 0 1 1 1 0 0 0 1 0, with a generator G = 1 0 1 1.

3. Using the link-state routing protocol (Dijkstra), generate the table that node u will end up with when the algorithm terminates. You must show all the steps of the algorithm from start to finish. Recall that we update the cost $D(v)$ for each neighbor as: $D(v) = min(D(v), D(w) + C(w, v))$.



4. [20 points] Using the distance vector protocol (Bellman-Ford), generate all the routing tables, including intermediate steps until the algorithm terminates (hence, when no more updates are sent). Recall that the least costs are calculated by $D_x(y) = min_v\{c(x,v) + D_v(y)\}$ and to calculate the tables we find this for each node y in the network.



5. [15 points] A network has been given the class C address: 128.32.54.0/24.
   (a) Assume a network has 3 subnets, with sizes 120, 30, 61. List the subnets as you would divide them. Recall that the first address in a subnet is the network number while the last address is the broadcast address.

   (b) Assume that two new subnetworks are attached with 10 and 8 nodes respectively. Can you allocate enough addresses from what you allocated in the previous part of the question? How would you allocate the rest of the addresses? (*Note: If you cannot allocate enough addresses given your answer in the first part, just reallocate them accordingly here.*)

6. [20 points] Assume two hosts, A and B, are on the same Ethernet segment and the propagation delay between them is 250 bit times. Recall that with CSMA/CD in Ethernet, an adapter must wait 96 bit times before it starts transmitting. Also, recall that the jam signal is 48 bits.

   (a) Is it possible for A to fully transmit a frame without detecting that B has also started transmitting a frame? Recall that an Ethernet frame has an 18 byte header, 8 byte preamble, and a data segment that's between 46 to 1500 bytes.

   (b) If A and B start transmitting at time $t = 0$, and A rolls 0 while B rolls 1 after detecting the collision, what time will A begin retransmitting its frame? What time will B start transmitting assuming that A and B are transmitting maximum sized Ethernet frames? When will B finish?