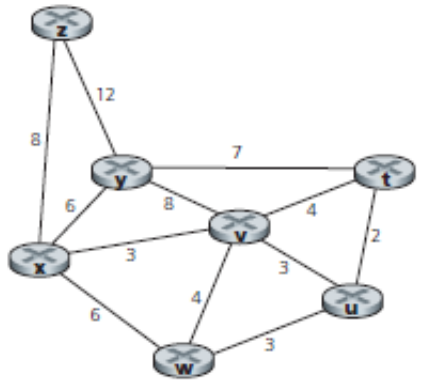
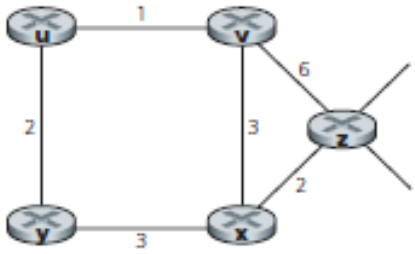
Com S 486 Assignment 4

Due: Monday, April 15, 11:59pm

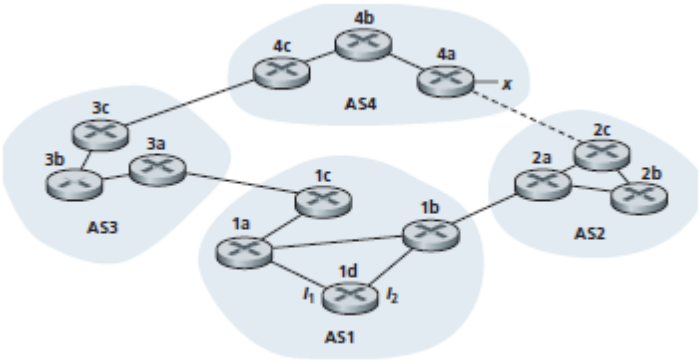
1. (20pts) Consider the following network. With the indicated link costs, use Dijikstra's shortest-path algorithm to compute the least-cost paths from u to all other nodes. Show how the algorithm works by computing a table similarly to page 13 of chapter 5 on the lecture notes.



2. (30pts) Consider the network shown below and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show how the distance-vector table entries at nodes u, v, w, x, y and z evolve step by step, similarly to page 24 of chapter 5 on the lecture notes.



3. (10pts) Consider the network shown below. Suppose each AS runs OSPF for its intra-AS routing protocol, and eBGP and iBGP are used for inter-AS routing protocol.
    a. Routers 31, 3b and 3c learn about prefix x directly from which routing protocol(s) (i.e., a subset of OSPF, eBGP and iBGP), respectively?
    b. Suppose there is **no** physical link between AS2 and AS4, none of AS has policy to deny routes advertised by other ASes, hot potato routing is used by every router, and costs l1<l2. What is the next-hop router selected by AS1 to forward an IP datagram destined at x?
    c. Suppose 4a and 2c are connected by a physical link, and other conditions are the same as in b. What is the next-hop router selected by AS1 to forward an IP datagram destined at x?



4. (10pts) Suppose the data content of a packet is the bit pattern 1011 0100 1011 1111 and an even parity scheme is used. What would the value of the field containing the parity bits be for the case of a two-dimensional parity scheme? Your answer should be such that a minimum-length parity field is used.
5. (10pts) Suppose the cyclic redundancy check (CRC) is used as error-detection coding. Let G = 10101, computer the R value for each of the following D:
    a. 1001010101
    b. 0101101010
6. (20pts) Consider two nodes, A and B, that use the slotted ALOHA protocol to contend for a shared channel. Suppose they both have unlimited frames to send. For each slot, A has probability p_A to send and B has probability p_B to send.
    a. For each slot, what is the probability that A sends its frame successfully? what is the probability that B sends its frame successfully? what is the probability that either A or B sends a frame successfully? what is the probability that both A and B send and thus collide? What is the probability that neither A or B sends a frame?
    b. What are the average throughputs of A and B, respectively?