Assignment 4
(Full Score: 100 points)
(**Due in class, Tuesday, 4/12/2011**)

| Your name:	Score:

Part I: Study Guide Questions
- Go to the course website's Supplementary Materials where you open Study Guide for Chapter 4 (you will need course web username and password to access it) at http://cs.salemstate.edu/~b_yi/2011Spring/CSC315A/resources/studyGuide/Chapter04_SG.pdf
- Read section "Most Important Ideas and Concepts from Chapter 4" (**no** submissions required).
- Pay attention to the following Study Guide Q&As:
  - 1, 3, 4, 6, 7, 9, 10, 13, 16, and 20.
  - (These Q&A's will give provide guidance to Part II of this assignment).
  - (**No** submissions required for this part of assignment.)

Part II: Problems from the Textbook (100 points)
Provide **short answers** for the following Problems of Chapter 4:

P4. Consider the network below.
   a. Suppose that this network is a datagram network. Show the forwarding table in router A, such that all traffic destined to host H3 is forwarded through interface 3.
   b. Suppose that this network is a datagram network. Can you write down a forwarding table in router A, such that all traffic from H1 destined to host H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4? (Hint: this is a trick question.)
   c. Now suppose that this network is a virtual circuit network and that there is one ongoing call between H1 and H3, and another ongoing call between H2 and H3. Write down a forwarding table in router A, such that all traffic from H I destined to host H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4.
   d. Assuming the same scenario as (c), write down the forwarding tables in nodes B, C, and D.
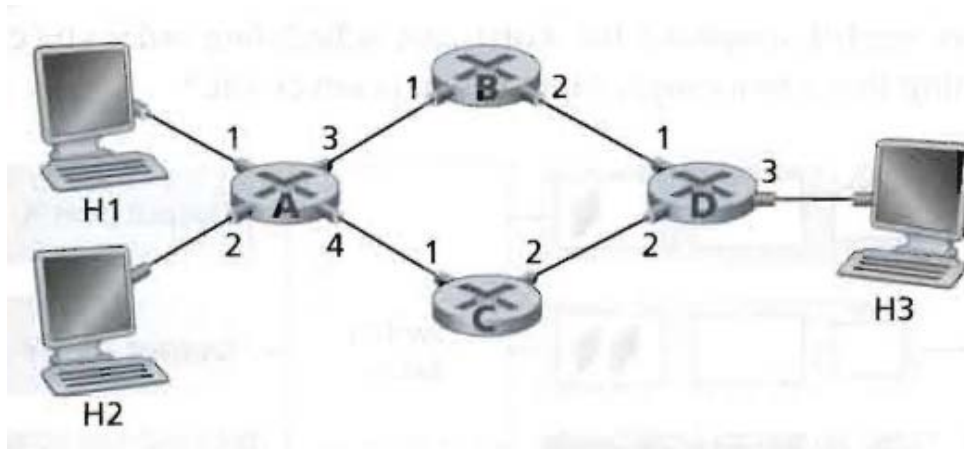
P8. Consider the switch shown below. Suppose that all datagrams have the same fixed length, that the switch operates in a slotted, synchronous manner, and that in one time slot a datagram can be transferred from an input port to an output port. The switch fabric is a crossbar so that at most one datagram can be transferred to a given output port in a time slot, but different output ports can receive datagrams from different input ports in a single time slot. What is the minimal number of time slots needed to transfer the packets shown from input ports to their output ports, assuming any input queue scheduling order you want (i .e., it need not have HOL blocking)? What is the largest number of slots needed, assuming the worst-case scheduling order you can devise, assuming that a non-empty input queue is never idle?
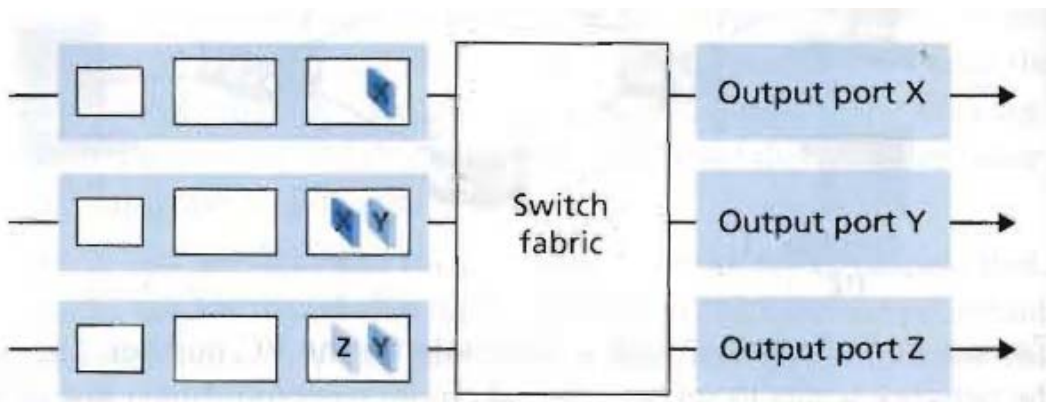
P9. Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

a. Provide a forwarding table that has four entries, uses longest prefix matching, and forwards packets to the correct link interfaces.

b. Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:

> 11001000 10010001 01010001 01010101
> 11100001 01000000 11000011 00111100
> 11100001 10000000 00010001 01110111

P10. Consider a datagram network using 8-bit host addresses. Suppose a router uses longest prefix matching and has the following forwarding table:

Prefix Match	Interface
00	0
010	1
011	2
10	2
11	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

P12. Consider a router that interconnects three subnets: Subnet I, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1 .17/24. Also suppose that Subnet 1 is required to support up to 63 interfaces, Subnet 2 is to support up to 95 interfaces, and Subnet 3 is to support up to 16 interfaces. Provide three network addresses (of the form *a.b.c .d/x*) that satisfy these constraints.

P17. Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes . Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

P24. Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from *x* to all network nodes. Show how the algorithm works by computing a table similar to Table 4.3 in the textbook.
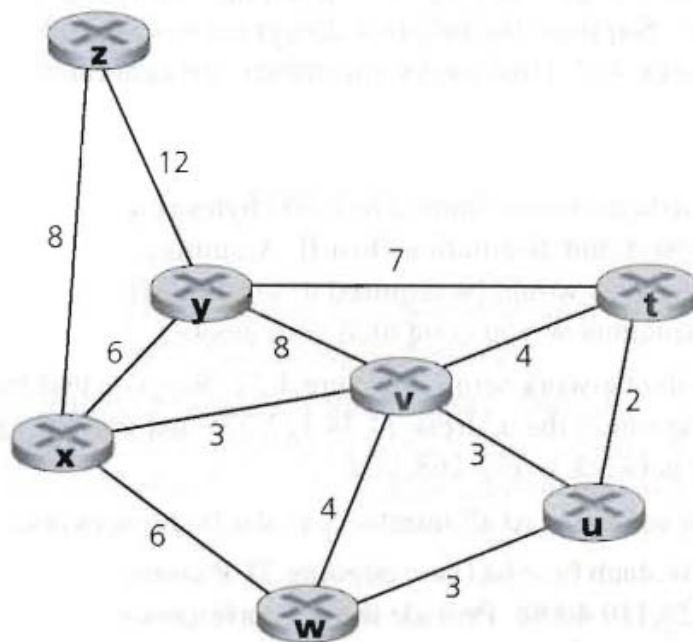
P35. Consider the network shown below. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is *no* physical link between AS2 and AS4.

    a. Router 3c learns about prefix x from which routing protocol: OSPF, RIP, eBGP, or iBGP?

    b. Router 3a learns about x from which routing protocol?

    c. Router 1c learns about x from which routing protocol?

    d. Router 1d learns about x from which routing protocol?