National University of Singapore
School of Computing

CS2105 **Problem Set 5** Semester 2 13/14

1. **(KR, Chapter 4, P12)** Consider a datagram newtork using 8-bit host addresses. Suppose a router uses longest prefix matching and has the follwoing forwarding table:

Prefix Match	Interface
11	0
101	1
100	2
otherwise	3

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

2. **(KR, Chapter 4, P16)** Consider a subnet with prefix 192.168.56.128/26. Give the range of IP addresses (of form xxx.xxx.xxx.xxx) that can be assigned to this network.

   Suppose an ISP owns the block of addresses of the form 192.168.56.128/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

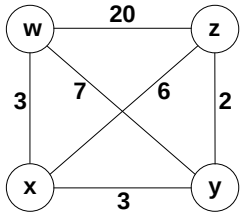
3. Two hosts A and B participate in a peer-to-peer file sharing application and need to connect to each other. Both A and B, however, are behind NATs.

   Devise a technique that will allow A to establish a TCP connection with B without application-specific NAT configuration, if

   (a) the NAT router uses a simple, predictable, algorithm to allocate a public port number for mapping to the local/private port number.

   (b) there is a third host, C, participating in the same file sharing session, that is not behind NAT.

4. **(CS2105 Final Exam, April 2006)** The following diagram shows a simple network topology with 4 nodes. The links in the diagram are labeled with the cost of each link. The nodes run distance vector routing protocol. The protocol has terminated, and each node knows the cost of the minimum cost path to every other node.



   (a) The following table shows an incomplete routing table at node x. Fill in the missing distance vector for x and z.

	cost to w	cost to x	cost to y	cost to z
from x		0		
from y			0	
from z				0

   (b) Now, suppose the cost of the link between x and w increases from 3 to 20. Node x detects the changes in the cost. Before x receives any new distance vector from its neighbors, triggered by these changes, x recomputes its new minimum-cost path to w, y, and z, and updates its distance vector.

Suppose that poisoned reverse is NOT used. What is the new computed cost from x to w?

(c) Suppose that poisoned reverse is used. What is the new computed cost from x to w?