

Introduction to Computer Networks

Homework 4 – Due Oct 29

[1] **(1 point)** What are the two most important network-layer functions in a datagram network? What are the three most important network-layer functions in a virtual circuit network?

[2] **(1 point)** Do the routers in both datagram networks and virtual-circuit networks use forwarding tables? If so, what the forwarding tables for both classes of network include?

[3] Routers.

a. **(1 point)** Describe how packet loss can occur at input ports.

b. **(1 point)** Describe how packet loss at input ports can be eliminated (without using infinite buffers)

[4] **(2 points)** 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
1	0
11	1
111	2
Otherwise	3

For each of the four interfaces, what are the associated range of destination host addresses and the number of address in the range?

[5]. Consider sending a 3,000-byte datagram into a link that has an MTU of 1500 bytes, and then into a link that has an MTU of 500 bytes. Suppose the original datagram is stamped with the identification number 466.

(a) **(0.5 point)** How many fragments are generated?

(b) **(1.5 points)** What is the identification number, size, flag, and offset for each? Fill in the following table:

fragment	Identification number	length	Frag flag	Offset
1				
2				
3				
4				
5				
6				
7				
8				
9				

[6]. **(2 points)** Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from z to all network nodes. Show how the algorithm works step by step by filling in the following table. D(y) is the current value of path cost from z to y;

$p(t)$ is the predecessor node along path from z to y ; N' is the set of nodes whose least path cost has been determined.

Step	N'	$D(y), p(y)$	$D(x), p(x)$	$D(u), p(u)$	$D(v), p(v)$	$D(w), p(w)$
1						
2						
3						
4						
5						
6						

