50.005 Quiz NS 1 (15 mins)
Name: _**Sample Solutions**_____ Student ID: _____

Note: During the quiz, you can consult written or printed materials. But you can't go online or look at anything electronic, including your laptop, smartphone, etc.

1. Data sent by network applications will eventually appear as link layer packets. In a bulk transfer (i.e., lots of application data sent quickly), a largest possible packet size should be used for efficiency. Give a reason why.

When the total packet size is larger, the percentage overhead of packet headers (whose sizes are fixed) is smaller. [2pts]

***Alternative answer*: Each packet incurs nodal processing overhead at each hop (e.g., router). When the packet size is larger, there are fewer packets, thus less nodal processing.**

2. When network traffic is bursty, _**packet [1pt]**_____ switching can significantly increase the utilization of communication bandwidth compared with _**circuit [1pt]**_____ switching.

3. Consider an end-to-end network path from a source to a destination. The path consists of two hops, and the packet loss rate of each hop is 10%.

(a) What is the packet loss rate of the end-to-end path?

19% [2pts]

(b) Assume that a lost packet is retransmitted until it is received by the destination. What is the probability that a packet will be retransmitted exactly *N* times before it is received?

$0.19^N \times 0.81$ [2pts]

4. 1000 bytes of data is sent as quickly as possible from A to B over a link of propagation delay 6ms and bandwidth 4 Mbits/s. Ignore nodal processing and queueing delays. (a) Draw a space-time diagram of the whole transfer, from when the first bit is sent by A to when the last bit is received by B. (b) Calculate the transmission delay and indicate it in the diagram. (c) Indicate the propagation delay in the diagram.

Diagram [2pts]; transmission delay & indication [2pts]; propagation delay indication [1pt]