YORK UNIVERSITÉ UNIVERSITY

CSE 3213: Communication Networks, Fall 2009
Instructor: Natalija Vlajic
Time Allowed: **15 minutes**

Quiz 1

Student Name: _____

Student Number: _____

1. [2 point]

(a) In class, we have discussed numerous advantages of 'layered' vs. 'monolithic' approach to networking. Would it be correct to say that layered approach to networking also results in a higher effective bandwidth, i.e. with layered approach we are able to transmit more useful/user data per each time unit? Provide a YES or NO answer, and a brief explanation!

NO. In fact, reduction of effective bandwidth is one of (a few) disadvantages of the layered approach. Namely, the layered approach requires that each of the layers adds its own header to the user's useful data. Hence, the overall amount of data that needs to be transmitted increases, consequently resulting in lower 'effective bandwidth'.

(b) According to the concept of Protocol Layering, each protocol data unit (PDU) of layer N is encapsulated in a PDU of layer (N-1). In some cases, it is also required that the layer-N PDU be broken into multiple (N-1)-layer PDUs (so-called segmentation), as illustrated below. In such a case, is it necessary that each (N-1)-layer segment obtains a copy of the **layer-N header**? Provide a YES or NO answer, and a brief explanation!

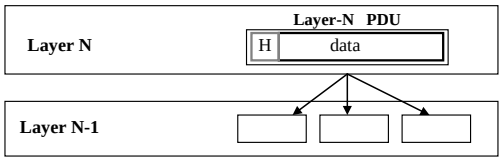

Figure 1

YES. Each (N-1)-layer PDU (i.e. segment) must obtain a copy of the layer-N header. Otherwise, we might end up with segments that do not contain some critical information. E.g. if an IP packet undergoes segmentation at the data-link layer, each (data-link) segment must contain a copy of the original IP header – together with the IP address of the sender and the receiver. Without this information, routing of such header-less segments would not be possible.

2. [1 point]
Given that IP packets always carry the destination address, how is it possible that a packet to a non-existing host can actually be transmitted several hops through the Internet?

Each IP address comprises NetID and HostID part.
Internet routing is not based on the entire content of an IP address at all times. Namely, on all but the last hop, the routing of IP packets is based (exclusively) on the NetID portion of their respective destination-IP address. Only upon reaching the network where a host is supposed to be (i.e. reside), it will be possible to notice that the given host actually does not exit.

3. [1 point]
What can you say about the **frequency spectrums** of the following two signals? Name one key similarity and one key difference?

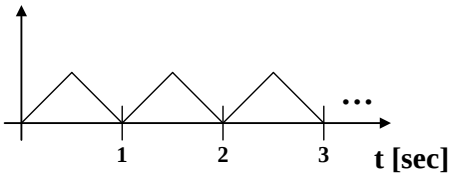

Figure 2.a

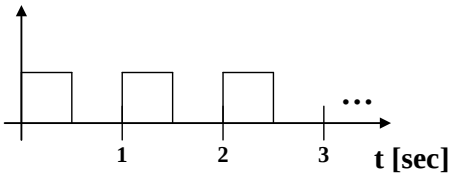

Figure 2.b

Both signals are periodic, with the same period of T=1[sec]. Hence, both signals will have discrete frequency spectrums comprised of the same main and higher harmonics – sinwaves of frequency **k*1** [Hz]. Nevertheless, the actual contribution (i.e. amplitude) of individual harmonics will be different for the two signals (i.e. the envelopes of the two spectrums will be different).

4. [1 point]
What will happen if a signal with the frequency spectrum shown in Figure 3.a gets sent through a channel/cable with the frequency characteristics (i.e. amplitude response) shown in Figure 3.b?

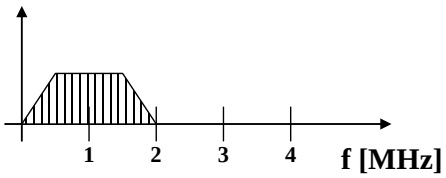

Figure 3.a

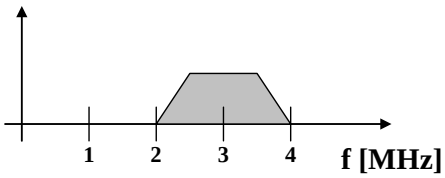

Figure 3.b

Based on Figure 3.b, the given channel completely eliminates/blocks all the frequencies form the signal's frequency spectrum. Hence, no signal will be observed at the receiving end of the cable.