Out: Sep. 13 (Thursday)
Due: 1:55pm (Hard Deadline) Thursday Sep. 20

- The problem sets form an important part of the learning in this course. Thus you are required to do them in order to pass.
- Try to be as clear and precise as possible in your presentation. Sloppy answers may be at a disadvantage, i.e., likely to receive fewer points.
- Please submit your answers via CANVAS system and no late assignments are accepted !!

Problem 1

What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of these layers?

Problem 2

A system has an $n$-layer protocol hierarchy. Applications generate messages of length $M$ bytes. At each of the layers, an $h$-byte header is added. What fraction of the network bandwidth is filled with headers? Try some practical values of $n$, $M$ and $h$ to get the rough estimation (in term of percentage) of the header overhead.

Problem 3

List six access technologies. Classify each one as residential access, company access, or mobile access.

Problem 4

Compare the delay in sending an $x$-bit message over a $k$-hop path in a circuit-switched network and a (lightly loaded) packet-switched network. The circuit setup time is $s$ seconds, the propagation delay is $d$ seconds per hop, the packet size is $p$ bits, and the data rate is $b$ bps. Under what conditions does the circuit-switched network have a longer delay? [NOTE: you need to explain the reasoning process on how you come out the final answer.]