**CSC 335 Data Communications and Network I**

**Homework 6**

1. (1 point) Routers in the core network use destination IP addresses to forward the packets. However, when the packet arrived at the final local network, destination MAC address is the one that the router uses to disseminate the packet. What is the protocol that helps the router to get the MAC address knowing the IP address? Please explain how it helps in sending an IP datagram from a source to a destination, both on the same local network.
2. (1 point) To interconnect all devices, the network layer uses globally unique IP address and routing scheme to deliver packets. With the increment of devices and waste of addresses from IP address classes, IP addresses are inadequate. Two solutions are proposed, namely CIDR and NAT. Please explain what is NAT and how does NAT distinguish between multiple local hosts?
3. (1 point) Differentiate between flow control and automatic repeat request.
4. (2 points) A TCP segment consisting of 1460 bytes of data and 20 bytes of header is sent to the IP layer, which appends another 20 bytes of header. This is then transmitted through two networks each of which uses an 18 bytes packet header/CRC. The destination network has a maximum frame size of 8000 bits. How many bytes including headers are delivered to the network layer at the destination? (hint: the maximum size refers to the entire frame at the link layer. To solve this problem, first determine what is the size of the payload in the link layer frame. This will be the size of the IP packet. From there, you have to calculate how many IP packets are needed to send all of the TCP data.)
5. (0.5 point) Addresses are the most important items in the header. The address for data link layer, network layer, and transport layer are MAC address, IP address, and port number. Please explain what is a port and why is it necessary to define ports at the receiving end for network services? Please identify the port number for SSH, Kerberos, and HTTPS.
6. (0.5 point) Internet Assigned Numbers Authority (IANA) is a standards organization that oversees global IP address allocation, autonomous system number allocation, rootzone management in the Domain Name System (DNS), media types, and other Internet Protocol-related symbols and Internet numbers. DNS is the hierarchical and decentralized naming system used to identify computers, servers, and other resources reachable through the Internet or other Internet Protocol (IP) networks. The domain name space consists of a tree data structure. Each node in the tree has a label and zero or more resource records, which hold information associated with the domain name. The DNS root zone is the top-level DNS zone, such as .com and country-code like .uk, in the hierarchical namespace of the DNS. Please identify the top level domain code for Barbados and University of Chile from the database <https://www.iana.org/domains/root/db>.
7. (1 point) Please describe the three-way handshake in TCP. If flow control and error correction is performed at the transport layer by TCP, explain why some communications systems also perform these functions at the link layer.