Networks and Distributed Systems	**Homework 1**
CS3700 Spring 2020	**January 15, 2020**

This homework is due at 11:59:59 PM on January 21, 2020 and is worth 2% of your grade.

Name: _____

Khoury Username: _____

Section: _____

Problem	**Possible**	**Score**
1	25	
2	25	
3	30	
4	10	
Total	90	

1a. What is a **Network**? Give an example of one. (10 pts)

1b. What is a **Node**? Give an example of one. (5 pts)

1c. What are **Routers** and what do they do? (5 pts)

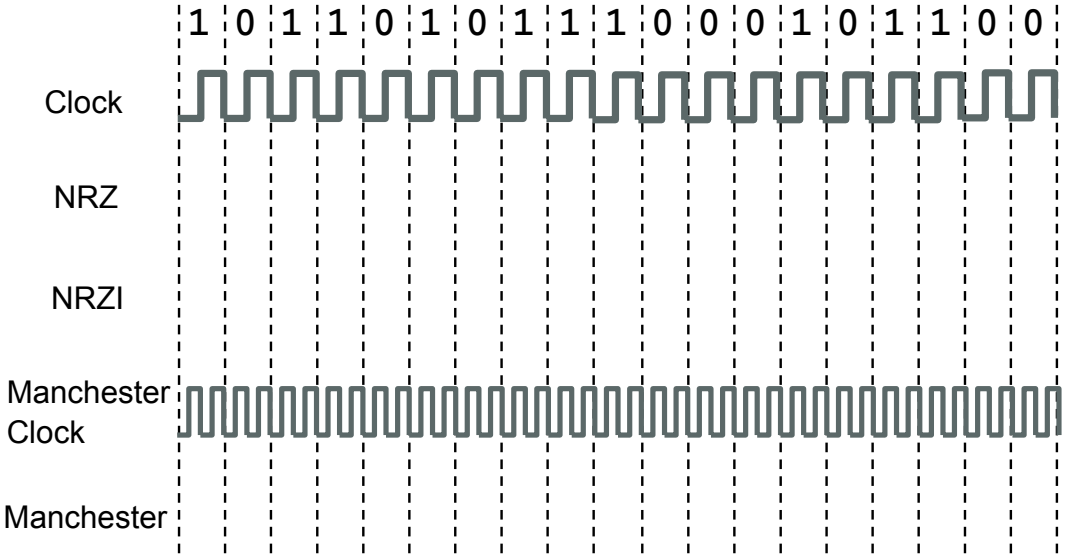
1d. What is the **OSI reference model?** (5 pts)

2a. Give two examples why the **Layered Network Stack** solves many of the issues in network architecture? (5 pts)

2b. What are the drawbacks of the **Layered Network Stack**? Give an example of a drawback. (5 pts)

2c. Choose **two** layers of the OSI Model and explain their role in the network. Give examples of their services, interfaces, and protocols. (15 pts)

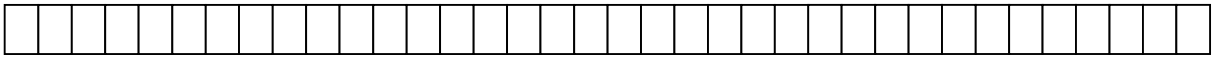
3a. Draw in the NRZ, NRZI and Manchester encodings for the bit pattern below.



You can use Figure 2.10 of Peterson and Davie as a model. (10 pts)

3b. Apply the HDLC bit-stuffing protocol to the pattern below and write down the resulting sequence in the boxes provided. You do not need to include any start frame/end frame sequences. .

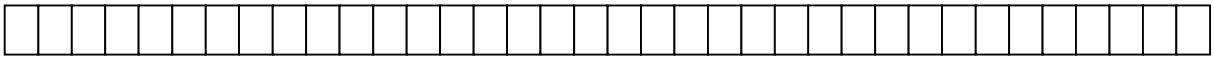
01011011111111011111111001



You may not need to use all of the boxes. (10 pts)

3c. If the bit pattern below is received at a HDLC receiver, what is the interpretation of this pattern?

01111110101111101101111100001111111 0



You may not need to use all of the boxes. (10 pts)

4a. Suppose that we have an Ethernet which has a bandwidth of 5 megabits/second. If the speed of light in copper is assumed to be 2.5×10^8 meters/second, what is the minimum frame size that we must select for a LAN of length 10,000 meters? *Note that there are 1000 bits in a kilobit, 1000 kilobits in a megabit, etc.* (10 pts)