NOTE: the exam will be on Chapters 6-9. In addition to problems like those below, the exam will have true/false, fill in the blank, and multiple choice questions. You would be wise to study all the terminology we have learned in the class thus far; links to Quizlet are posted on Piazza. For each FULL page completed (and brought to class on Oct 2\textsuperscript{nd}), 1 point extra credit will be earned (up to 3 points possible).

1. List the five process states discussed in class (include exit) and define each with one sentence. Then draw the graph that shows all the process transitions between these five states.

2. Define difference between an I/O intensive and a compute intensive process. What does the OS do to ensure a compute intensive process does not “hog” the system?

3. Suppose the overhead to swap a running process with a ready process is 1 ms. Would a time slice of 1 ms be a good time slice amount?

4. How long would it take to transmit a 10MB file using each of the following media. Assume 1 Kbps = 1024 bps, etc.
   a. A 56 Kbps modem (dial up)
   b. A 1.5 Mbps DSL line (an older DSL line)
   c. A 100 Mbps Ethernet link (Fast Ethernet)

5. Name the layers in the Internet Protocol Stack and describe the goal of each layer.
6. The figure below shows two shared bus networks connected via a bridge.
   a. If A is transmitting a packet to B, will D look at the packet and ask “is this for me”?
   b. If A is transmitting a packet to C, will D look at the packet and ask “is this for me”?
   c. Would your answers to a or b change if the bridge was a repeater instead? Explain.
   d. Would your answers to a or b change if the network was a star with a central switch connected to all nodes (see figure above)? Explain.

7. Suppose node A is sending node B a packet using the ARQ algorithm.
   a. Suppose packet 4 is lost from A to B. Which node(s) respond and how?
   b. Suppose the ACK for packet 7 is lost from B to A. Which node(s) respond and how?

8. Consider the network shown below with the current measured delays between two nodes.
   a. List all possible simple paths between nodes A and D; simple paths are those that do not repeat a node (i.e., no loop).
   b. Which path provides the shortest delay?

9. Explain the difference between authentication and authorization.
10. First, explain the difference between a symmetric encryption algorithm and an asymmetric encryption algorithm. Then, define which type of algorithm each of the following are:
   a. Caesar Cipher
   b. DES
   c. AES
   d. RSA

11. In regards to the Simple Password “Hash” Algorithm shown in class.
   a. Use this simple hash function and determine the hashed password of “judy”.
   b. If someone were to attempt to log on to Judy’s account using the password “mike”, would he or she be granted access? Explain why or why not, and discuss why this might be possible in some cases.

12. Using Caesar Cipher with shift = 5, encrypt the word SIMPLE. Then decrypt the word rnsjx using the same shift.

13. Using the block encoding matrix, encrypt the word NO with the following matrix:

\[
x = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}
\]

14. Suppose you and I both have a picture of your cat, and this picture contains 1200 x 1800 RGB pixels. To send you a hidden message, I will reduce the intensity of each red, green, and blue value by one.
   a. How long of a message will I send you in bits?
   b. If we use ASCII (8 bits), how many characters will I send you?
   c. If we assume approximately 3,000 characters on a single-spaced page, how many pages of text can I hide in the image this way?
   d. What is the technical term for hiding a message is this way?