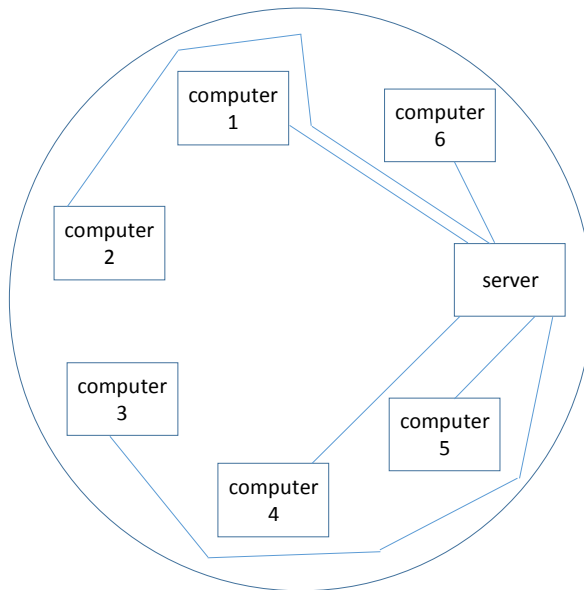


Test #2 (100 points)

Calculator Allowed

- 1.(a) What term do we use for the logical configuration of a network, which may or may not resemble the actual physical layout of the computers and servers that make up that network?
Hint: It is a branch of mathematics that starts with the letter T. _____
- (b) A *ring* network is one in which the computers are connected in a circular chain, each computer linked to the next. The network below certainly looks like a ring, but is it a ring? _____. If not, what is it? _____



2. Use $X(0) = 17$ as the starting point for a pseudorandom number generator (PNG). What do we call this starting value? Answer: the _____. Then, use values of $A = 179$, $B = 773$, and $N = 256$ to execute 5 iterations of the PNG to generate 5 outputs. Convert each output to hex and then to an 8-bit value. Chain all 5 of your 8-bit values together to make a 40-bit bitstream. Show all work below. Remember, the next X is always found by the formula $(AX + B) \bmod N$, utilizing the previous X . When counting to 5, do not count the $X(0)$ value of 17. In other words, generate 5 new values of X in order to form your 40-bit bitstream.

3. Use your ASCII table to encode the message

STA#1

as hex. Then XOR that message with the 40-bit bitstream you created in question 2 (or just 40 made-up bits if you couldn't answer question 2) to create an encrypted bitstream. **Give your encrypted bitstream in both binary and hex.**

4. Explain briefly how the recipient should proceed in order to decode whatever you produced in question 3. Be sure to explain how the recipient can somehow manage to have a 40-bit bitstream that would match the one you produced in question 2. If you couldn't answer #2 or #3, simply explain what *would happen* if everything were working correctly.

5. What is even parity used for (2 words)? _____ Explain briefly how even parity works.
6. State 2 examples of lossy compression (_____ and _____) and one example of lossless compression (_____).
7. What name do we give to a form of “data hiding” in which the secret message is hidden or interspersed within a seemingly innocent-looking file? _____ *Hint: The word starts with the letter S.*
8. Convert each of the following power ratios to dB: (Write +__dB or –__dB in each case.)
- 350 W increased to 700 W = _____
- 200 mW decreased to 1 mW = _____
- 5 mW increased to 1 GW = _____
9. Convert each of the following decibel changes to a power ratio:
- +6 dB = _____ : _____
- 45 dB = _____ : _____
- +10 dB = _____ : _____
10. Sketch a circuit diagram for $\sim(A \text{ xor } B)$ below. Then, use a truth table (either below or on the reverse side of this sheet) to prove that $\sim(A \text{ xor } B)$ is always equivalent to saying that A and B have the same truth value.