You may take this test with you afterwards, but you must turn in your bubble form answer sheet.

This test has the following sections:

I. True/False .......................... 60 points; (30 questions, 2 points each)
II. Multiple Choice.................. 39 points; (13 questions, 3 points each)

99 + 1 for free = 100 points total

This test is worth 10% of your final grade. You must put your answers on the bubble form. This test is closed book and closed notes. For the multiple choice problems, select the best answer for each one and select the appropriate letter on your answer sheet. Be careful - more than one answer may seem to be correct. Some questions are tricky.

**True/False: (2 points each)** On your bubble form fill out A for true and B for false.

T  F  1. In the “magic” age-guessing game done in class using the 6 tables of numbers, it is necessary to understand binary numbers in order to do the trick.

T  F  2. If we are using odd parity, then we need to append a 1 to the bits 1101 since 1101 represents decimal 13, which is an odd number.

**The following questions refer to Chapter 1 of the book "Blown to Bits"**

T  F  3. One of the Koans described is: "Technology grows at a double-exponential rate."

T  F  4. Moore's Law dictates that the density of integrated circuits doubles every couple of years.

**The following question(s) refer to Chapter 2 of the book "Blown to Bits."**

T  F  5. Many color printers encode GPS location information hidden in the printed pixels.

**The following question(s) refer to Chapter 3 of the book "Blown to Bits."**

T  F  6. Steganography is the name of the technique where digital computers are used to make highly accurate copies of old images.

**The following questions refer to the short story "And Mimsey were the Borogoves".**

T  F  7. In the story Scotty and Emma were able to learn so well partially because they are young.

T  F  8. The technological artifacts found by Scotty down by the creek are primitive and require modifications to be useful.
The following are questions having to do with Chapter 5 of the book "Blown to Bits." As we did in class, for each of these choose A (for True) if the statement/example/topic was covered in the chapter, B (for False) if the statement/example/topic was not covered in the chapter.

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>T</td>
<td>F</td>
<td>9. The “Caesar cipher” is a rotating encoding technique used to shift letters based on the letters C-a-e-s-a-r.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>10. The Vigenere cipher is considered unbreakable so far.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>11. In theory one-time pads are unbreakable</td>
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<tr>
<td>T</td>
<td>F</td>
<td>12. Cryptographic systems are considered more reliable if the details of how they work are made public.</td>
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<td>T</td>
<td>F</td>
<td>13. Big Data is a description of very large values used as part of a computer program.</td>
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<td>T</td>
<td>F</td>
<td>14. Rather than find a minimal spanning tree as we did in the Muddy City problem, we could instead find the shortest path to visit all cities, ending up where we started. Finding this shortest path would be easier than finding the minimal spanning tree.</td>
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<td>T</td>
<td>F</td>
<td>15. In Microsoft Excel an if statement can be used to selectively average a range of values.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>16. In Microsoft Excel the number of decimal places stored and the number displayed are not necessarily the same.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>17. Microsoft Excel allows sorting names in alphabetical order and by numbers, however it does not allow sorting by dates.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>18. The “mind-reader” program that guesses a number between 1..50 would always be able to find the number in 6 guesses or less.</td>
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<td>T</td>
<td>F</td>
<td>19. Consider the “number guess” program implemented in AppInventor. Values such as current guess or amount to add/subtract can be either stored visibly on the screen in a TextBox or can be stored behind the scenes in a variable.</td>
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<td>T</td>
<td>F</td>
<td>20. An algorithm is a precise description of steps to be used in solving a problem.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>21. By using additional parity bits for both rows and columns, a single bit error in the original message can be detected.</td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>22. By using additional parity bits for both rows and columns, a single bit error in the original message can be detected and also corrected.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>23. A selection sort requires fewer swaps than does a bubble sort.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>24. Binary search is generally slower than linear search.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>25. Think back to the Muddy City problem represented using a graph. The solution set of paths can always be found by using a strategy of iteratively adding the next-shortest path.</td>
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<tr>
<td>T</td>
<td>F</td>
<td>26. Think back to the Ice Cream Town problem represented using a graph, which is an</td>
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</table>
example of a *dominating set*. The solution (smallest set of points covering the graph) can always be found by using a strategy of selecting nodes that are one layer in from the outside set of nodes.

T F 27. Recall the tower building activity using Legos. To build a tower 70 stories high it would take 7 weeks.

T F 28. Computers are fast enough that it doesn’t really make a difference which sorting technique is used.

T F 29. The difficulty to quickly do prime factorization of a large number is the basis behind some strong encryption techniques.

T F 30. It is easy to tell whether or not a picture has been digitally manipulated.

**Multiple Choice (3 points each)**

31. The video clip of Watson shown in class and discussed illustrates that:
   a) A computer can beat a human at a particular task, even if it wouldn’t necessarily pass the Turing Test.
   b) Computers are faster than humans at identifying mathematical patterns
   c) People are still smarter than computers
   d) Computers are smarter than people
   e) Even though computers are good at some tasks, people are still much better at many others.

32. The hexadecimal value \( AA \) in binary is:
   a) 01011010
   b) 10100101
   c) 10101010
   d) 01010101
   e) None of the above

33. Depending on the context in which it is used, the following binary string could represent:
   0101 0010
   a) \( 82_{10} \)
   b) \( 5_{10} \ 2_{10} \)
   c) \( 52_{16} \)
   d) Some ASCII character value
   e) All of the above

34. In class we’ve looked at the characteristics of decimal, binary and hexadecimal digits. Taking those same ideas and applying them to *trinary* (base 3) numbers, what would be the valid digits used in an *trinary* number?
   a) 0,1,2
   b) 0,1,2,3
   c) 0,3
   d) 2,3
   e) None of the above
35. Consider the shortcut for converting directly from hexadecimal number to binary numbers, where each hexadecimal digit corresponds to 4 binary digits. How many binary digits would correspond to each octal (base 8) digit?
   
a) 1
b) 2
c) 3
d) 4
e) 8

36. Think back to the exercise in class where we counted how many students were in the class. Everyone started out as a number 1, then compared with another person standing. One person became the sum of the two numbers, and the other person sat down. If a set of such comparisons were all done one stage at a time, how many stages would be needed to count 200 people?
   
a) 8
b) 10
c) 50
d) 500
e) None of the above

37. Consider the ASCII table, where the decimal value for ‘A’ is 65, the value for ‘a’ is 97, and the value for ‘0’ is 48. What is the equivalent of the following binary message, where each 7 bits represent a single ASCII character?

   1001000 1000101 1001101 101000

   a) OHMY
b) GOCS
c) HELP
d) OLYM
e) None of the above

38. If a transposition cipher is being used, what is the translation for the text:
   THEEND

   a) SGDDMC
b) UIFFOF
c) VJGGPG
d) WKHHQF
e) None of the above

39. Think back to the “Muddy Town” activity that we explored in class. How many of the following would likely use the same sort of minimal spanning tree that we found for Muddy Town?

   Plumbing, Electric lines, a UPS delivery route, Airline routes between cities

   a) 1
b) 2
c) 3
d) 4
e) None of the above
40. In Roger Fenton’s photo “The Valley of the Shadow of Death” there were two pictures, one with cannon balls on the road and one without. After many attempts at analysis one was determined to be taken before the other because of:
   a) The difference in shadows in the two pictures
   b) Pictures taken at a modern day visit to the same location
   c) Captions from an old newspaper that used the pictures
   d) The difference in the position of rocks on the hillside
   e) All of the above

41. The point of showing examples of photo manipulation in class and developing our own ability to manipulate photos is:
   a) Manipulating photos is fun and entertaining
   b) Understanding photo manipulation tools helps us to appreciate the artistry of other manipulated photos
   c) Understanding photo manipulation helps us question whether or not photos are real
   d) Manipulating photos is helpful for developing illustrative materials
   e) All of the above

42. How many of the following questions could be answered using the food happiness data we gathered in class?
   • On average how happy are UIC students when they eat?
   • Are males in our class happier on average than females in the class?
   • How many times a day on average do students in our class eat?
   • Do students in the class tend to be happier when eating at home vs. at a restaurant?

   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above

43. How many of the following were data representation issues that we resolved when we chose a food happiness data format for the entire class?

   • What is the scale of data (1..3, 1..5, 1..7, 1..10)
   • Format for date
   • The need to add gender to the data we were entering
   • Whether or not information was lost when we made all happiness level records numeric

   a) 1
   b) 2
   c) 3
   d) 4
   e) None of the above