## ECS 271 Homework Assignment #7 (Due June 8 2004)

1. If a test contains 20 true-false questions, in how many different ways can a student mark her test?

2. In how many ways can six persons be seated at a round table?

3. The number of combinations of r objects selected from a set of n objects is written as nCr. Often it is necessary to use the fact that nCr = nC(n-r). First justify this formula informally. Then prove the formula mathematically.

4. In how many ways can a subcommittee of 4 persons be chosen from a committee of 10 persons if the chairman of the full committee is required to be on the subcommittee?

5. Consider a random binary sequence such as  $[0\ 0\ 1\ 0\ 1\ ...\ 1\ 0]$  of length *i*. Suppose you wish to generate another random sequence of the same length by tossing a coin *i* times. What is the probability that both the strings match exactly?

6. Consider a population A comprised of n of random binary strings, each string of length *i*. Consider a test string T, of the same length.

(a) what is the probability that none of the strings in A match T?

(b) what is the probability that at least one string in A matches T?

7. Show that summation  $\sum_{k=0}^{n} \binom{n}{k} 2^{k} = 3^{n}$ .

8. Consider bit strings of length *l*.

- (a) How many possible bit strings of length l are there?
- (b) Number of possible subsets of bit strings of length l are \_\_\_\_\_
- (c) How many schemas of length l are there?
- (d) A given bit string of length l is an instance of \_\_\_\_\_ schemas.

9. Prove that any string of length l is an instance of different schema. ( The best way to prove this is by illustration. )

10. Consider a ternary string S, of length l composed of the alphabet  $\{0, 1, *\}$ . Assume that i of the l characters in the string are either zero or one. Stated differently, there are *i* fixed positions.

(a) Over these *i* fixed positions, how many schemata are there?

(b) Over the length *l*, how many sets of fixed positions are there?