ECE 341 - Test #1: Name _____

Combinations, Permitations, and Discrete Probability

1. Enumeration

Assume you roll two 6-sided dice and take the difference. For example, if you roll (1, 5), your score is 4 points (the difference). Using emumeration, determine the odds of score 0 - 6 points. Please show your work.

2. Combinations and Permutations

In Bison Poker, you play with a deck of cards containg 72 cards:

- Six suits (clubs, diamonds, hearts, spades, jackrabbits, and bison)
- Each suit contains 12 cards (Ace through queen no kings).

Each hand in Bison Poker contains five cards.

Using combinatorics, determine the following:

- Total number of 5-card hands (order does't matter)
- Number of ways to be dealt a flush (five cards of one suit)
- Number of ways to be dealt a two-pair (xx yy a)

3. Conditional Probability & Dice Games

Assume you play a game where you roll three 6-sided dice. After rolling the dice, you can then re-roll as many dice as you like one time.

Determine the probability or getting three-of-a-kind using conditional probabilities

$$p(3) = p(3|A)p(A) + p(3|B)p(B) + p(3|C)p(C)$$

where

•	A: you rolled three of a kind in the first roll	roll = xxx	keep all dice
•	B: you rolled two-of-kind in the first roll:	roll = xx y	re-roll y

• C: you rolled no pairs

roll = x y z re-roll y and z

4. Binomial Distribution

Assume you are flipping 14 coins where each coin has a probability of a heads being 0.4 (p = 0.4).

Determine the probability of flipping 6 heads two different ways {Monte-Carlo, enumeration, combinatorics, formula, convolution, and/or z-transform). Please show your work.

5. Geometric & Pascal Distribution

Let A, B, and C have geometric distributions:

- A = the number of rolls until you get a 1 on a 5-sided die (p = 1/5)
- B = the number of rolls until you get a 1 on a 6-sided die (p = 1/6)
- C = the number of rolls until you get a 1 on a 7-sided die (p = 1/7)

Let X be a Pascal distribution

• X = A + B + C

Determine the probability that X=10 using two different methods

• (Monte-Carlo, enumeration, combinatorics, convolution, z-transform, etc)

Please show your work.