ECE 341 - Test #1

Combinations, Permitations, and Discrete Probability

Open-Book, Open Notes. Calculators & Tarot cards allowed. Chegg or other people *not* allowed.

1. Enumeration (dice)

Let X be the sum of two 6-sided dice. Determine the probability that X is divisible by 3 using enumeration.

2. Combinations and Permutations (cards)

In 8-card stud,

- 3 cards are placed face up in the middle, and
- Each player is dealt 5 cards.

Each player can then make the best hand they can with these 8 cards.

a) How many hands are possible in 8-card stud?

- *How many ways can you deal 8 cards from a 52-card deck. Order doesn't matter.*

b) Determine the probabililty of having 2-pair in 8-card stud.

- *Hand = (aa bb cdef) or*
- *Hand = (aa bb cc de) or*
- *Hand = (aa bb cc dd)*

where each letter is a different value.

3. Binomial Distribution

Let

M be your birth month (1..12) plus 2

Determine the probability of rolling M ones when rolling sixteen 5-sided dice (p = 1/5)

M birth month plus 2 (4..15)	probability of M ones with 16 die rolls p = 1/5

4. Convolution

Determine by hand (i.e. show your work - Matlab doesn't count) the product of the following polynomials using convoltion.

$$Y = (2 + Mx + Dx^2)(3 + 4x)$$

where

- M is your birth month (1..12) and
- D is your birth date (1..31)

M birth month (1..12)	D birth date (1..31)	Y(x)

5. Geometric & z-Transforms

Let

- X be the number of rolls of an 8-sided die until you get a one with the following moment-generating function:

$$X = \left(\frac{1/8}{z - 7/8} \right)$$

- Y be the number of rolls of an 4-sided die until you get a one with the following moment-generating function:

$$Y = \left(\frac{1/4}{z - 3/4} \right)$$

Determine the pdf for W = X + Y using z-transforms

(the number of times you have to roll an 8 sided die until you get a 1, then roll a 4 sided die until you get a 1)