Student Name:

Homework # 3

Instructions: Prepare your deliverables in clean letter size printer-quality papers with a high-contrast pencil (engineering pads are also accepted). Attach this assignment sheet as cover page, show all your work, and box all your solutions. All Matlab code needs to be published, and all figures needs to have proper axis labeling and legends. Homework assignments will be collected during class time on the due date. *No late homework or submission that do not strictly follow the provided instructions will not be accepted.*

- **Homework problems not to be graded**
  - From textbook (Lathi):
    - Ch 2: 1.8, 2.11, 3.2, 4.2,

- **Homework problems to be graded**

A poker hand of 5 cards is randomly drawn from a standard size deck of 52 cards. Find the following probabilities and justify your work:

a) Four of a kind (4 cards of the same denomination/face value)
b) Straight (cards in "order," e.g., a 4, 5, 6, 7 and 8; ace can be high or low)
c) Full house (3 of the same denomination, and 2 of another)
d) Two pair (two of same denomination and two of another, but four of a kind)
e) One pair (only two of the same denomination)

a) $\frac{624}{2,598,960} = \boxed{0.24\%}$

$$\frac{{}_{13}C_1 \times {}_4C_4 \times {}_{12}C_1 \times {}_4C_1}{{}_{52}C_5}$$

1 particular card 4 times

1 remaining card 1 time

any and all possible combinations

b) $\frac{10,200}{2,598,960} = \boxed{0.39\%}$

$$\frac{{}_{10}C_1 \times \left({}_4C_1\right)^5 - {}_{10}C_1 \times {}_4C_1}{{}_{52}C_5}$$

Possible orders of 5 cards

straight flush

royal flush

all combinations

$\frac{3744}{2,598,960} = \boxed{1.44\%}$

$$\frac{{}_{13}C_1 \times {}_4C_3 \times {}_{12}C_1 \times {}_4C_2}{{}_{52}C_5}$$

3 cards of same suit

2 cards from another suit

all combinations

Pair of similar numbers, twice

~~Pairs of~~ ~~Cards of same suit~~ ~~twice~~

remaining card

$$\frac{{}_{13}C_2 \times \left({}_4C_2\right)^2 \times {}_{11}C_1 \times {}_4C_1}{{}_{52}C_5}$$

${}_{52}C_5$ — all combinations

d) $\frac{123,552}{2,598,960} = \boxed{7.62\%}$

1 pair of similar number

remaining cards

$$\frac{{}_{13}C_1 \times {}_4C_2 \times {}_{12}C_3 \times \left({}_4C_1\right)^3}{{}_{52}C_5}$$

${}_{52}C_5$ — all combinations

$\frac{1,098,240}{2,598,960} = \boxed{42.3\%}$