ENGR 0020 PROB & STAT FOR ENGINEERS I

Recitation Week 5

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Office Hour: Thursday 2:00 – 3:00pm, 1023 Benedum Hall

Goals:

1. To help to understand the lecture and homework questions.
2. To take quizzes for getting the feedback of the class. The quizzes will take 15 mins at the end of recitation.

1. **(Sample Space, Event, Counting, Probability)**
   (a) How many distinct permutations can be made from the letters of the word *COLUMNS*? What's the sample space in this problem?
   (b) How many of these permutations start with the letter M?
   (c) How many of these permutations end with the letter O?
   (d) How many of these permutations start with the letter M or end with O?
   (e) How many of these permutations start with the letter M but don't end with O?

2. **(Random Variable, pdf, cdf, Conditional Probability, Expectation, Variance)** A fast-food restaurant operates both a drive-through facility and a walk-in facility. On a randomly selected day, let X and Y, respectively, be the proportions of the time that the drive-through and walk-in facilities are in use, and suppose that the joint density function of these random variables is

$$f(x,y) = \begin{cases} C(x+2y), & 0 \le x \le 1, 0 \le y \le 1, \\ 0, & \text{elsewhere.} \end{cases}$$

   (a) Find C.
   (b) Find the marginal density function of X.
   (c) Find the cumulative distribution function of X.
   (d) Give that the drive-through facility is busy less than one-half of the time, find the probability that the walk-in facility is busy with greater than one-half of the time.
   (e) Are X and Y independent?
   (f) Find $\mathbb{E}[X]$ and $Var[X]$.
   (g) Let $Z = X - 2Y + 3$. Find $\mathbb{E}[Z]$ and $Var[Z]$.