

ECS 315: Probability and Random Processes**2019/1**

HW 11 — Due: November 21, 4 PM

*Lecturer: Prapun Suksompong, Ph.D.***Instructions**

- (a) This assignment has 2 pages.
- (b) (1 pt) Hard-copies are distributed in class. Original pdf file can be downloaded from the course website. Work and write your answers **directly on the provided hardcopy/file** (not on other blank sheet(s) of paper).
- (c) (1 pt) Write your first name and the last three digits of your student ID in the spaces provided on the upper-right corner of this page. Furthermore, for online submission, your file name should start with your 10-digit student ID, followed by a space, the course code, a space, and the assignment number: “5565242231 315 HW10.pdf”
- (d) (8 pt) It is important that you try to solve all problems.
- (e) Late submission will be heavily penalized.

Problem 1 (Yates and Goodman, 2005, Q3.4.5). X is a continuous uniform RV on the interval $(-5, 5)$.

(a) What is its pdf $f_X(x)$?

(b) What is its cdf $F_X(x)$?

(c) What is $\mathbb{E}[X]$?

(d) What is $\mathbb{E}[X^5]$?

(e) What is $\mathbb{E}[e^X]$?

Problem 2 (Randomly Phased Sinusoid). Suppose Θ is a uniform random variable on the interval $(0, 2\pi)$.

(a) Consider another random variable X defined by

$$X = 5 \cos(7t + \Theta)$$

where t is some constant. Find $\mathbb{E}[X]$.

(b) Consider another random variable Y defined by

$$Y = 5 \cos(7t_1 + \Theta) \times 5 \cos(7t_2 + \Theta)$$

where t_1 and t_2 are some constants. Find $\mathbb{E}[Y]$.