ECEN321 Engineering Statistics (XMUT)

Homework 4 (5%)

Submit your individual solutions in one PDF file online on the VUW course website. Check the course website for the due date.

Total = 17 marks.

Q1. [Binomial] Let X denote the number of true-or-false questions that a student answers wrongly, and assume that X is a binomial random variable with p = 0.001. If the very hardworking student attempts 1000 questions, determine the following:

a) $P(X = 1)$ [1 mark]
b) $P(X \geq 1)$ [1 mark]
c) $P(X \leq 2)$ [1 mark]
d) Mean $E(X)$, and variance, $V(X)$, of X [1 mark]

Q2. [Geometric] Suppose that during an online class, each of the teacher's question to the students has a probability of 0.02 of someone responding, that is, of not getting a silence response. Assume that the questions are independent.

a) What is the probability that the first question that is responded is the tenth question? [1 mark]
b) What is the probability that it requires more than five questions for someone to respond? [1 mark]
c) What is the mean number of questions needed to get a response? [1 mark]

Q3. [Negative Binomial] An online automatic marking operation that helps to do marking of homework stops the marking process after three plagiarism cases are detected. Suppose that the probability of a plagiarism case is 0.001 and each homework submission is independent.

a) What is the mean number of markings before the automatic marking process is stopped? [1 mark]
b) What is the standard deviation of the number of markings before the marking is stopped? [1 mark]

Q4. [Poisson] The number of students falling asleep in lectures is assumed to be Poisson distributed with a mean of 0.1 student per hour of lecture.

a) What is the probability that there are two students falling asleep in an hour of lecture? [1 mark]
b) What is the probability that there is one student falling asleep in 10 hours of lecture? [1 mark]
c) What is the probability that there is no student falling asleep in 20 hours of lecture? [1 mark]
d) What is the probability that there are at least two students falling asleep in 10 hours of lecture? [1 mark]

Q5. [Normal] The time it takes for a student to finish doing a Homework is normally distributed with an average time of one hour and a standard deviation of five minutes.

a) What is the probability that a student finish doing the homework in less than 45 minutes? [1 mark]
b) What is the probability that it takes a student more than 65 minutes to finish the homework? [1 mark]
c) What is the time that it takes approximately 99% of all students to finish doing the homework? [1 mark]

Q6. [Normal approximation to Binomial] A university Web site contains errors on 50 of 1000 pages. If 100 pages are sampled randomly, without replacement, approximate the probability that at least 1 of the pages in error are in the sample. [1 mark]

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