10/22/2017 **Statistics I—Midterm Exam** 唐麗英教授 Name: 沈佩蓮 student ID: 05134066

1. 交卷時請將試卷連同答案本一起交回 （未繳回試卷者視同未繳答案本）；
2. 請使用試卷後方做為計算紙使用（嚴禁使用其他計算紙）；
3. 請依照座位表入座，並準備學生證供查驗;
4. 僅可使用不具有儲存資料或可程式化功能之計算器;
5. 所有計算過程均以四捨五入方式取小數點後四位數字，但最後答案可取小數兩位；
6. 計算題請寫出計算過程以便給部分分數;
7. 答卷時間：**10：10 – 12：10**；
8. 總分：**100**

Part I: Multiple Choice (Only one answer is correct) (單選題)

(※請將單選題答案以英文字大寫排成一列，如:1. ___, 2. ___, …, 5. ___。)

List the answers in Part I in a row as: 1. ___, 2. ___, …, 5. ___。

C 1. A **stem-and-leaf** plot is ideally suited to convert a mass of unorganized data into (1%)

A) a histogram B) a Pareto Diagram C) an ordered array D) a pie chart E) None of the above.

2. **Descriptive statistics** consists of procedures used to (1%)

A) Summarize the information and describe the characteristics of a set of data.

B) Decide how large a sample should be taken.

C) Make inferences about population characteristics from information contained in a sample.

D) None of the above.

B 3. The **mean** and **variance** of 100 products are 50 and 5, respectively. Use Chebyshev's Rule to describe the data: (1%) $1-\frac{1}{4}=\frac{3}{4}$

A) approximately 95% of the data will lie between 40 and 60.

B) at least 75% of the data will lie between 40 and 60.

C) approximately 68% students whose test scores will lie between 40 and 60.

D) at least 89% students whose test scores will lie between 35 and 65.

E) None of the above. $\frac{9}{9}$

4. In analyzing quantitative (or numerical) data, which one of the following graphical devices is appropriate? (1%)

A) Bar graph B) Histogram C) Pareto Diagram D) Pie Chart E) None of the above

$\frac{x-\bar{x}}{\sigma}>0 \Rightarrow x>\bar{x}$.

5. If a Z score is +2.1, it means that the original score is (1%)

E) Less than mean B) greater than mean C) equal to the mean D) None of the above.

Part II: Give a brief answer is to the following questions (簡答題)

1. What is the difference between **Stratified random Sampling** and **Systematic Sampling**? (4%)

2. In a club of **ten** men and **six** women,
   a) in how many ways can a committee of **four** selected if there must be **at least one of each sex**? (Do not simplify your answer, 不需簡化答案，僅列出算式即可) (4%)
   b) what is the probability that a committee of **four** selected must consist of **at least two men** and **at least two women?** (Do not simplify your answer)(3%)

3. The manager of a large company wanted to conduct a survey to determine the **amount of time** that employees spend on meeting. He randomly selected 100 employees and gathered the information to conduct the analysis.
   a) Describe the **population** and the **sample** of this study. (3%)
   b) Identify the **variable** that you are interested for this study. (2%)
   c) What is the **experimental unit** on which the **variable** is measured? (2%)

4. For each of the following random variables, determine whether the variable is **quantitative** or **qualitative**. If the variable is quantitative, determine whether the variable is **discrete** or **continuous** random variable.
   a) Type of compact cars sold. (1%)
   b) Rating of a customer satisfaction (*very unsatisfied, unsatisfied, neutral, satisfied, very satisfied).* (1%)
   c) Number of products in a production line. (1%)
   d) Color of a package design (1%)
   e) time to complete a Statistics examination. (1%)

Part III: Show your work to receive partial credit.

1. Suppose that 5 people are in a room. What is the probability that at least two people have the same birthday?
   (Do not simplify the final result 不需簡化答案，僅列出算式即可) (5%)

2. Two cards are drawn from a deck of 52 cards. Find the probability that the draw includes ~~and~~ ace and a king? (Do not simplify the final result 不需簡化答案，僅列出算式即可) (5%)

3. Suppose P(A)=0.1 and P(B)=0.5.
   (a) If $P(A|B)=0.1$, are A and B independent? (2%)
   (b) If $P(A \cup B)=0.65$, are A and B mutually exclusive? If not, what is the relationship between A and B ? Why? (3%)

4. Using the following data: 38, 10, 15, 48, 6, 9, 20, 32, 24, 8, 41, 40, 23,
   a) draw a **stem-and-leaf** plot. From this plot, can you determine whether the distribution is symmetric, left skewed or right skewed? (3%)
   b) find the **five-number summary** and the **interquartile range**. (3%)

c) construct a **frequency table** which contains the **frequency percentage** and **cumulative frequency percentage**. (4%)

d) Draw a **histogram**. From this plot, can you determine whether the distribution is symmetric, left skewed or right skewed? (5%)

5. An educational psychologist wants to study the relationship between the sleep time(in hours) and the ability to solve problems. Five persons participated in the study, each person was given a set of simple addition problems, and the number of errors was recorded in the following table :

Sleep time (hours)	4	5	5	7	8
Number of errors	10	7	8	6	4

(a) Draw a scatter diagram. What do you observe from this diagram? (2%)

(b) Find the sample covariance and correlation coefficient between sleep time and number of errors. (7%)

(c) Explain the correlation between sleep time and the number of errors using the correlation coefficient obtained in question (b). (2%)

(d) Find the regression equation for predicting the number of errors.(7%)

(e) When the sleep time is increased by 1 hour, what is the change of the average number of errors? (2%)

(f) What is the predicted number of errors when the sleep time is 6 hours?(1%)

6. Printer manufacturers allow customers to diagnose problems with their products on the web sites. Suppose that printer failures are associated with two types of problems: hardware, and software, with probabilities 0.7 and 0.3, respectively. The probability of a printer failure given by a hardware problem is 0.9; the probability of a printer failure given by a software problem is 0.2. If a customer enters the manufacturer's web site to diagnose a printer failure, what is the probability the failure is caused by a software problem? (6%)

7. Assume that A and B are two events with $P(A) = 0.5$, $P(B) = 0.3$ and $P(A \cap B) = 0.2$.

(a) What is the probability that exactly one event occurs? (1%)

(b) What is the probability that A occurs only. (1%)

(c) What is the probability that either A occurs or B occurs, but not both. (1%)

(d) Are A and B independent ? If not, what is the relationship between A and B. (2%)

8. Flip two dices. Let X be the sum of the two numbers observed.

(a) Find the **probability distribution** of X. (3%)

(b) Compute the **expected value** and the **standard deviation** of X. (4%)

(c) What is the **probability that X exceeds** $\mu+2\sigma$? (3%)