國立台灣科技大學九十八學年度碩博士在職專班招生試題

系所組別： 管理研究所EDBA博士在職專班

科　　目： 統計學

Statistics

共六題, 總計 100 分。依序作答。

1. (10%) A bag contains seven coins — five fair coins (fair coin — a head on one side and a tail on the other side), one coin with a head on both sides, and one with a tail on both sides. Randomly select one coin from the bag and flip the selected coin. Given that the flip results in a head, what is the probability that the selected coin is a fair coin.

2. (10%) A random sample $\{X_1, \ldots, X_{100}\}$ of size 100 is drawn from a normal population with unknown mean μ and known variance $\sigma^2 = 200^2$. Suppose sample mean $\bar{X} = \sum_{i=1}^{100} X_i/100 = 25$ is observed. Can we accept the hypothesis that $\mu = 40$? Support your answer.

3. (30%) A quality control engineer tries to perform a hypothesis testing on the defective rate p of a production line. The engineer keeps inspecting the items until he finds the first defective. Let T denote the total number of items the engineer inspects. The engineer wants to test the hypothesis $H_0 : p \geq 10\%$ against $H_1 : p < 10\%$.

   (a) Which of the following regions is an appropriate *critical region*? Why?

   i. $\{T \geq k\}$ for some constant k.

   ii. $\{T \leq k\}$ for some constant k.

   (b) What is the probability distribution of T?

   (c) Find the *type I error rate* of the test for $k = 15$.

4. (20%) State whether each of the following variables is quantitative or qualitative and indicate the measure scale being used.

   (a) annual sales

   (b) soft-drink size (small, medium, or large)

   (c) earnings per share

   (d) method of payment (cash, check, credit card)

5. (10%) A sample of ten stocks on the New York Stock Exchange shows the following price-earning ratios

   9 4 6 7 3 11 4 6 4 7

   Compute the mean, median, mode, range, variance, and standard deviation.

6. (20%) Suppose $\mathrm{P}(A) = .40, \mathrm{P}(A|B) = .60$ and $\mathrm{P}(B|A) = .30$.

   (a) Find $\mathrm{P}(A \cap B)$ and $\mathrm{P}(B)$.

   (b) Are events A and B independent? Why or why not?