

1. [10+10 points] Show the definitions of (a) the invertible function and (b) the composite function.
2. [10+10 points] (a) Use a C-like language to write the *Binary-Search* algorithm by a recursive function. (b) How to count the average case of the time complexity of this algorithm.
3. [10+10 points] (a) How to count the number of divisors of 30030? (b) How many ways can we factorize the number into two factors?
4. [10 points] If  $A=\{a, b, d, e, f, g, h\}$  and  $B=\{w, x, y, z\}$ . How to count the number of onto functions  $f: A \rightarrow B$ .
5. [10 points] Prove that, if 101 integers are selected from the set  $S=\{1, 2, \dots, 200\}$ , then there are 2 integers such that one divide the other.
6. [10 points] Prove the Generalized DeMorgan's Law of logic.
7. [10 points] Suppose we roll  $x$  fair dice. Consider the event that  $Z(x)$ : "the sum of dice is an even sum". What is the probability density function  $\Pr(Z(x))$ ?

試題隨卷繳回