

國立嘉義大學九十四學年度  
資訊工程學系碩士班招生考試試題

科目：數學

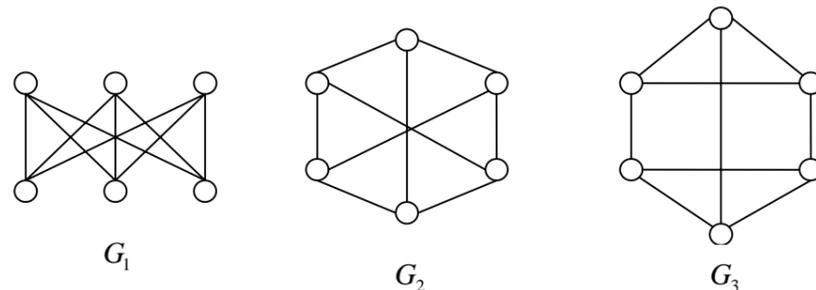
一、(20%)

Consider  $L = \{w \mid w \in \{a, b, c\}^*, w \text{ contains an even number of } a\text{'s, } w \text{ has prefix } abc \text{ and suffix } cc\}$ .

- (a) Give a regular grammar generating  $L$ .
- (b) Give a deterministic finite automaton that accepts  $L$ .

二、(10%)

- (a) Draw a connected graph containing a bridge but no cut-vertices.
- (b) Determine whether the following graphs are isomorphic. If there is any graph which is isomorphic with another, please indicate.



三、(20%)

- (a) How many cards must be drawn from a standard 52-card deck to guarantee 3 cards of the same suit?
- (b) In a group of 30 people who like rock, country and classical music, 20 like rock, 19 like classical, 12 like both rock and country, 9 like rock and classical, 15 like country and classical, and 6 like rock, country, and classical. How many like country?

四、(20%)

- (a) What is the advantage of using circularly linked lists to represent polynomials? Use an example to explain your answer.
- (b) Show how to multiply the complex numbers  $a + bi$  and  $c + di$  using only THREE real multiplications. Your method should take  $a, b, c,$  and  $d$  as input and produce the real component  $(ac - bd)$  and the imaginary component  $(ad + bc)$  separately. Hint: One of the three multiplications is  $c(a + b)$ .

五、(15%)

- (a) What is a stable sorting method? Is Quick sort stable? Use an example to illustrate your answer.
- (b) What is the worst case in time complexity of Quick sort? Use an example to illustrate the worst case.
- (c) What is the computing time for Quick sort if the file splits roughly into two equal parts each time a record is positioned correctly? Prove your answer.

六、(15%)

Suppose that  $f(0) = 0, f(1) = 1, f(2) = 1, f(3) = 2, f(4) = 3, f(5) = 5, f(6) = 8, f(7) = 13, f(8) = 21, f(9) = 34, \dots$

- (a) Define  $f(n)$ .
- (b) Write a recursive function to compute  $f(n)$ .
- (c) Write an iterative function to compute  $f(n)$ .