國立雲林科技大學

100學年度碩士班暨碩士在職專班招生考試試題

系所：資工系

科目：離散數學

1. Given the following **undirected** graph. **(20%)**

G=(N,A), N(G)={a , b , c , d, e },

A(G)={(a , b) , (a , c) , (b, c), (b , d), (b,e), (c, d), (c, e), (d, e)}

(a) Complete the graph. (4%)

(b) Determine the adjacency matrix of the graph. (5%)

(c) Determine the number of spanning trees of the graph. (11%)

2. Solve the following recurrence equation by giving the tightest (up to a constant factor) upper bound for $T(n)$ in Big-Oh notation. Assume that $T(n)=c$, for $n \le 1$ and c is a constant for the following recurrence.

(Eq) $T(n)=4T(\frac{n}{4})+n\log n$ **(20%)**

3. Determine the best "big Oh" of time complexity for each following expession. **(10%)**

(1)$a=5+10+15+...+5n$

(2)$b=1+\frac{1}{2}+\frac{1}{3}+...+\frac{1}{n}$

(3)$c=\frac{(n^2+\log n)(n+9)}{n+n^2}$

(4)$d=2\log n-8n+n\log n$

4. Determine if the following are statements? **(10%)**

(a) The moon is made of green cheese.

(b) He is certainly a tall man.

(c) Two is a prime number.

(d) Will the game be over soon?

(e) Next year interest rates will rise.

5. Prove that the amount of postage greater than or equal to 8 cents can be built using only 3-cent and 5-cent stamps. **(10%)**

6. The following algorithm is a recursive version of the sequential search algorithm: **(10%)**

```
SequentialSearchRecursive(list L; integer i, n; itemtype x)
//searches list L from L[i] to L[n] for item x
  if i > n then
      write("Not found")
  else
      if L[i] = x then
          write("Found")
      else
          SequentialSearch(L, i + 1, n, x)
      end if
  end if
```

Please analyze the algorithm using recurrence relations.

7. For the relation {(1,1), (2,2), (1,2), (2,1), (1,3), (3,1), (3,2), (2,3), (3,3), (4,4), (5,5), (4,5), (5,4)}, what is **[3]** and **[4]**? **(10%)**

8. Write **gcd**(1326, 252) as a linear combination of 1326 and 252. **(10%)**