



國立雲林科技大學 114 學年度  
碩士班招生考試試題

系所：資工系  
科目：計算機概論(1)

1. Given the matrix:

$$A = \begin{bmatrix} 2 & 1 & -3 & 2 \\ 4 & 3 & -5 & 6 \\ 6 & 5 & -9 & 10 \end{bmatrix}$$

Find the null space of the matrix  $A$  and list the basis vectors.

(5 分)

2. Show that the set  $S$  spans  $R^3$ .

(5 分)

$$S = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & -1 \\ 3 & 2 & 1 \end{bmatrix}$$

3. Find the eigenvalues and corresponding eigenvectors of the following matrix:

$$A = \begin{bmatrix} 3 & 1 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

Also, determine the dimension of the eigenspace for each eigenvalue.

(6 分)

4. Given  $\det(A) = 2$  and  $\det(B) = 4$ , calculate:

$$\det(A^3 B^{-1} A^T)$$

(4 分)

5. Determine whether the set  $S$  is linearly independent or linearly dependent.

$$S = \{(2, 1, 3), (4, -1, 2), (1, 0, 5)\}$$

(5 分)

6. Find the transition matrix from  $B$  to  $B'$  for bases for  $R^2$  below

$$B = \begin{bmatrix} -3 & 4 \\ 2 & -2 \end{bmatrix} \quad \text{and} \quad B' = \begin{bmatrix} -1 & 2 \\ 2 & -2 \end{bmatrix}$$

(5 分)

7. Convert the following infix expression to postfix expression

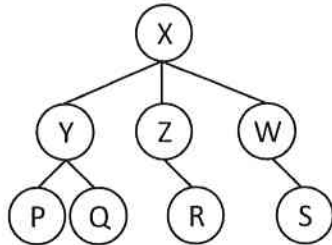
$$(A + B \times (C - D)) / (E + F \times G - H)$$

(4 分)



8. For the following graph, determine the Depth-First Search (DFS) and Breadth-First Search (BFS) traversal starting from vertex  $X$ . (6 分)

Graph:



9. Please implement the missing part (A) in the C++ code so that the print function outputs: 30 20 10. (5 分)

```
#include <iostream>
using namespace std;
struct node {
    int data;
    node *next;
    node(int x) {
        data = x;
        next = NULL;
    }
};
```

```
(A)
}
int main() {
    struct node *head;
    struct node d1(30), d2(20), d3(10);
    head = &d1;
    d1.next = &d2;
    d2.next = &d3;
    print(head);
    return 0;
}
```

```
void print(struct node *head) {
```

10. Implement a recursive function in C named `double fun01(double x, int n)` to compute the value of the following polynomial:

$$f(x) = n * x^n + (n - 1) * x^{n-1} + (n - 2) * x^{n-2} + \dots + 2 * x^2 + x^1 \quad (5 \text{ 分})$$

Hint: use the `pow(x, n)` function from the math library to compute  $x^n$ .



11. Using the generation function method to solve the recurrence relation

$$a_n - 3a_{n-1} + 2a_{n-2} = 0, \quad n \geq 2$$

with initial conditions  $a_0 = 2, a_1 = 5$ . (10 分)

12. Consider a system consisting of four resources of the same type that are shared by four processes, each of which needs at least two resources. Show that the system is deadlock-free or not.

(10 分)

13. Determine whether or not the given pairs are logically equivalent, where  $w$ ,  $x$ , and  $y$  are statements.

A.  $(w \Rightarrow x) \vee y$  and  $w \Rightarrow (x \vee y)$  (5 分)

B.  $\neg(w \wedge x)$  and  $\neg w \wedge \neg x$  (5 分)

C.  $(w \vee x) \Rightarrow y$  and  $(w \Rightarrow y) \wedge (x \Rightarrow y)$  (5 分)

14. Given the following set of processes all of which arrive the system at time 0, with the length of the CPU burst given in milliseconds, please answer the following questions and show the order of processes for each question

Process	Burst Time	Priority
$P_1$	48	3
$P_2$	16	5
$P_3$	16	2
$P_4$	24	4
$P_5$	36	1
$P_6$	48	6

A. What are the completion time and average waiting time of these processes by using the first-come, first served scheduling algorithm? (5 分)

B. What are the completion time and average waiting time of these processes by using the shortest-job-first scheduling algorithm? (5 分)

C. Suppose a smaller priority number stands for a higher priority. What is the completion time of these processes by using a non-preemptive priority scheduling algorithm?

(5 分)