Notice : Please make your answers as clear and readable as possible. You can answer in Chinese.

1. Please give a recursive algorithm, pseudo code or program to compute m * n, where m and n are integers and m, n > 0. (10%)

2. (1) Assume that only integers, +, -, *, /, (and) are used in an expression. For example, 4+(5-6)*8/(3-2). Please explain how to convert infix expression to postfix expression by giving an algorithm. Also, explain which data structures you will use.
   (2) Give the postfix expression of 4+(5-6)*8/(3-2)　　　　(20%)

3. You are given a task to do addition and subtraction of two sparse polynomials(很多係數是 0 的多項式). Please give the algorithm and data structures you will use considering time and space efficiency. (15%)

4. Tamkang University has 24000 students. Please explain your idea and the data structures you will choose to manage the information of the students based on their I.D. number(學號) by performing insertion, deletion and search operations considering time and space efficiency. Assume that insertion and deletion operations seldom occur, but the search operation based on I.D. number occurs every day. (15%)

5. (1) define stack
   (2) define queue
   (3) define circular queue
   (4) explain the advantage of circular queue (10%)

6. (1) Nine integers are inserted into an empty max heap in the following order. Please draw the final max heap. The properties of the max heap must be kept after each integer is inserted. 29, 41, 38, 82, 99, 16, 28, 45, 25.
   (2) With the following array-based declaration for the max heap, please give the algorithm for inserting an integer (a node) into a max heap. You may define and use the necessary parameters.
       int heap[MAX_SIZE];　　/* MAX_SIZE-1 is the maximum heap size */　(20%)

7. To sort N integers, give the time complexity of every sorting method listed below.
   (1) Bubble sort　　　　　　　(10%)
   (2) Selection sort
   (3) Merge sort
   (4) Heap sort
   (5) Insertion sort