本考科禁用掌上型計算機

（請於此線以下開始出題）

1. (20%) Mark the answers **true** and **false** as follows:
    (a) A binary search cannot be applied to a linked list.
    (b) A linear search cannot be applied to an array-based list.
    (c) A binary search cannot be applied to an array-based list.
    (d) A binary search is always faster than a linear search.
    (e) A binary search cannot be applied to an unsorted list.
    (f) A stack exhibits LIFO behavior.
    (g) A queue exhibits FIFO behavior.
    (h) A stack and a queue are different versions of the same abstract data
    (i) A binary search tree allows $\log_2 N$ searching in a linked structure.
    (j) In a graph, the vertices represent the objects being modeled.
    (k) The bubble sort algorithm involves finding the smallest item in the unsorted portion of the array and swapping it with the current item.
    (l) The selection sort algorithm involves finding the smallest item in the unsorted portion of the array and swapping it with the current item.
    (m) The bubble sort algorithm swaps every out-of-order pair it sees.
    (n) The Quicksort algorithm swaps every out-of-order pair encountered from different ends of the array.
    (o) The Quicksort algorithm is always quick.
    (p) The shape of a binary search tree depends on the order in which the items are inserted.
    (q) The edges in a graph represent relationships.
    (r) Arithmetic can be performed in the accumulator.
    (s) The Z bit is 1 if the accumulator is zero.
    (t) The N bit is 0 if the accumulator is negative.
2. (10%) Given an example to introduce the operations of the **CPU scheduling** mechanisms. (at least three mechanisms)
3. (10%) What are the purposes of **register, cache memory, main memory** and **disk**? Also illustrate their roles in a computer system.
4. (10%) Give brief explanation to each of the following items.
    (a)   **DMA** (Direct Memory Access)
    (b)   **XOR** Operation
    (c)   **TCP/IP** Network
5. (10%) What is an **IP address** and how is it composed?
6. (10%) Write down a C program to calculate **n!** by recursive technique.
7. (20%) Write down a C program to multiply two matrices.
8. (10%) Explain the difference among the terms **virtual function, late binding**, and **polymorphism**.