

## 國立臺北科技大學 113 學年度碩士班招生考試

系所組別：2210 電子工程系碩士班甲組

## 第一節 計算機概論 試題

第 1 頁 共 1 頁

**注意事項：**

1. 本試題共 10 題，各題配分列於題後，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Multicore processors.
  - a. Having multiple cores in a processor is potentially beneficial for the performance of task execution. Is it beneficial for the *throughput* and/or *response time* of task execution? Why? (5%)
  - b. Why multicore processors are indispensable for modern computer systems? (5%)
  - c. Considering different mixture of the tasks to be executed, when is a multicore processor the *most* and *least* efficient for the overall performance, respectively? (5%)
2. Memory hierarchy.
  - a. Draw a generic *storage-device hierarchy*. (5%)
  - b. Explain the organization of the hierarchy in terms of the *storage capacity* and *access time*. (5%)
3. Data structures.
  - a. Explain *search tree* and *hash table* in details. Provide an example of each. (5%)
  - b. Why are search trees still being widely used, when hash tables seem to provide better expected access performance? (5%)
4. Representation of numbers.
  - a. Explain and compare *fixed-point* and *floating-point numbers*. What are their advantages and drawbacks, respectively? (5%)

- b. Explain *one's complement* and *two's complement*. Which one is more commonly used in modern computers now? Why? Please explain in detail. (5%)
5. Logical operations. Use C or C++ programming language to implement a function `popu_count()` that returns the number of bit-1s in an unsigned integer `n`. The prototype of the function should be `int popu_count(unsigned int n)`. For convenience, you may safely assume that `n` is 64-bit long, if needed. Please do not use any libraries such as C++ STL. Make your program as efficient as possible. (10%)
  6. Processes and threads.
    - a. What are *processes* and *threads*? Explain and compare them in detail. (5%)
    - b. What are the advantages and limitations of threads, as compared to processes? (5%)
  7. Concerning the *asymptotic notations*. Show that  $\lg(n!) = \Theta(n \lg n)$ . (10%)
  8. Define and explain the following problems. When will they happen? What would you suggest to solve each of them, please?
    - a. *Race condition*. (5%)
    - b. *Convoy effect*. (5%)
  9. Provide simple example(s) to explain the purposes and mechanisms of *random backoff*? How does it work? (5%)
  10. There are many neurons in a neural network, each activated by the activation function. What is an activation function? Explain Sigmoid and ReLU, two popular choices of activation functions. What are their primary advantages and drawbacks, if any? (10%)