114cc01

國立臺北科技大學114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

注意事項：

1. 本試題共 10 題，每題 10 分，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. (10%) Comparisons between quick sort and merge sort.
   (a) What is the difference between merge sort and quick sort? (5%)
   (b) Why the quick sort can perform better than merge sort? (5%)
2. (10%) About quick sort.
   (a) Please describe a worst case of the quick sort. (4%)
   (b) Provide a policy to avoid the worst case. (4%)
   (c) What is the time complexity when bumping into a worst case. (2%)
3. (10%) Given that the recursion of all pair shortest path algorithm is

$$S^k(i,j) = min\{S^{k-1}(i,j), S^{k-1}(i,k) + S^{k-1}(k,j)\}$$

Assume there are three vertices v_1, v_2, and v_3 in the network and the initial S^0 is as follows.

	v_1	v_2	v_3
v_1	0	4	10
v_2	8	0	4
v_3	2	∞	0

   (a) Please draw the relationship between v_1, v_2, and v_3 (1%)
   (b) Fill S^1, S^2, and S^3 (9%)

4. (10%) Given the array [3,5,1,10,2,7,6]. Please perform the heapify operation to convert the array into a Max-Heap, following the heap property. Start the heapify process from the last non-leaf node and adjust the array step by step until the entire array satisfies the Max-Heap property. Write down the array after each adjustment.
5. (10%) How many comparisons are needed to perform a binary search in a set with 127 elements? (Please show the details)
6. (10%) Please describe the differences between a process and a thread in an operating system by definition, resource allocation, efficiency, communication, and application scenarios.
7. (10%) Please explain the operating principles of virtual memory, including the following aspects:
   (a) How are virtual addresses mapped to physical addresses? (3%)
   (b) How does the paging mechanism work? (4%)
   (c) How does the operating system handle situations when physical memory is insufficient? (3%)
8. (10%) Which of the following four CPU scheduling algorithms may cause "starvation"? Please explain why.
   (i) first-come, first-served (ii) shortest job first (iii) round robin (iv) priority scheduling
9. (10%) About thrashing.
   (a) What is thrashing? Please define thrashing and explain how it affects system performance. (5%)
   (b) How to identify if the system is experiencing thrashing? Please describe the indicators or phenomena that can be observed to determine whether the system is in a state of thrashing. (5%)
10. (10%) Please describe the details in the procedures of HTTPS, which includes six main steps: client initiates https request, server responds with certificate, client verifies the certificate, session key exchange, secure communication established, and data transmission.