國立屏東教育大學 99 學年度研究所碩士班入學考試

計算機概論(A)（含資料結構）試題

（資訊科學系資訊工程碩士班）

※請注意：1.本試題共二頁。
　　　　　2.答案須寫在答案卷上，否則不予計分。

問答題（共 100 分）

1. (1) What is the binary representation of 24.75? (5%)
   (2) Convert -35 into an 8-bit two's complement binary number. (5%)
   (3) The following message was originally transmitted with odd parity in each short bit string. In which strings have errors definitely occurred? (5%)
       (a) 01001000
       (b) 10100010
       (c) 11001110
       (d) 11110000

2. (1) What is the difference between deadlock and starvation? (10%)
   (2) What problem arises as the length of the time slices in a time-sharing system are made smaller and smaller? (10%)

3. Consider a chained hash table of size **M** that contains **n** items. The performance of the table decreases as the load factor $\lambda = $ **n** / **M** increases. In order to keep the load factor below 1, we propose to double the size of the array when **n = M**. However, in order to do so we must rehash all of the elements in the table. Explain why rehashing is necessary. (15%)

4. Given the following sorting algorithms: insertion sort, merge sort, heapsort, quicksort, counting sort, and bucket sort. Answer the following sub-problems. (10%)
   (1) What is stable?
   (2) For above algorithms, which are stable and which are unstable? If your answers are unstable, please explain the reasons.
   (3) Given a simple scheme that makes any sorting algorithm stable.

5. Determine the following sums: (10%)
   (1) $C(n, 0) + C(n, 1) + C(n, 2) + \ldots + C(n, r) + \ldots + C(n, n)$
   (2) $C(n, 1) + 2C(n, 2) + \ldots + rC(n, r) + \ldots + nC(n, n)$
   (3) $C(n, 1)2^1 + 2C(n, 2)2^2 + 3C(n, 3)2^3 + \ldots + rC(n, r)2^r + \ldots + nC(n, n)2^n$

6. Determine the shortest path between *a* and *z* in the following graph. Please redraw the graph in the answer paper and emphasize the shortest path with heavy edges. Also, please write down the length of the shortest path. (10%)
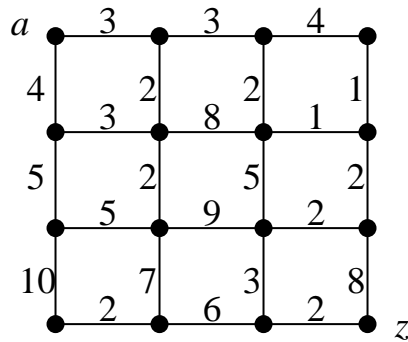
7. Consider the following page reference string:

$$1,2,3,4,2,1,3,2,6,2,1,2,3,6,3,2,1,2,3,5.$$

Assume there are three frames. How many page faults would occur for the following replacement algorithms? (10%)
   (1) LRU replacement
   (2) Optimal replacement

8. Suppose that the 5 stages of the pipeline are IF, ID, EX, MEM, and WB. For the following code sequence, identify whether there exists data hazards. Use multiple-clock-cycle pipeline diagram to show your answers to the following questions. (10%)

      lw $t2, 200($t1)
      add $t3, $ t1, $t2
      and $t2, $ t3, $t4
      lw $t3, 200($t2)
      sw $t4, 200($t3)