國立清華大學 107 學年度碩士班考試入學試題

系所班組別：生命科學院丙組

考試科目（代碼）：計算機概論(演算法與計算機數學)(0604)

1. (10 %) Is the following Bare Bones program self-terminating? Explain your answer.

```
while X not 0 do;
    decr X;
end
```

2. (10%) What are the levels of artificial intelligence? Explain them.

3. (10%) Assume there are four buckets in hashing table. The hashing function is: (key value)% (the number of buckets). Each bucket can only keep one key value. When the collision occurs, the solution is to double the numbers of buckets and find a new hashing function to avoid collision.
   (a) What are the hashing results after inserting 8, 11, 21. Please draw the corresponding results. (3%)
   (b) After (a), then insert 16. What is the hashing result? (7%)

4. (10%) What is Turing test? (5%) Please write down the most important characteristic of it. (5%)

5. (10%) What are two major approaches to represent sound? (2%) Describe their advantages and disadvantages. (8%)

6. (10%) Describe Von Neumann architecture. (5%) What is Von Neumann bottleneck? (5%)

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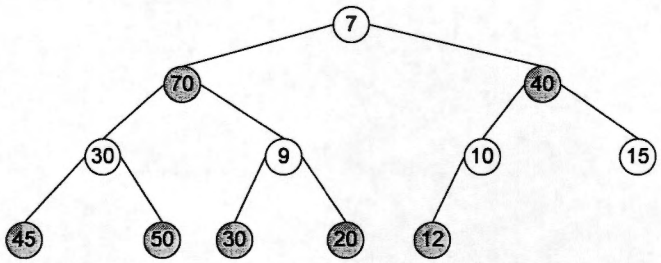
7. (10%) The following figure demonstrates a structure popularly employed in the chess game systems. Examine its characteristics carefully and answer the following questions:



   a. What is the name of this data structure? (2%)
   b. What are the advantages and disadvantages of this structure? (8%)

8. (15%) Which ones of the following expressions are correct? Please justify your answers:
   a. $3n^2-100n+6 = O(n)$
   b. $\lg(n!) = \Theta(n \lg n)$
   c. $n! = O(n^n)$
   d. $(n+a)^b = \Theta(n^b)$　　a, b are real constants
   e. $(n+a)^b = \Omega(n^{b+1})$

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9. (15%) A series of food tests was carried out in Taiwan recently. The tests consisted in finding out which company had produced "tainted oil (劣質油)", that is, oil that they produced had been mixed with some harmful ingredients. They obtained the following results:

Company	Oil (bottles) tested	Oil (bottles) with harmful ingredients	Rate
Ta-Hsin	1000	700	70%
Wei-Hsin	800	400	50%

The conclusion was that Ta-Hsin Company's practices were more unethical than Wei-Hsin Company's (since 70%>50%)

Given the equation and table below:

$$p = \frac{2 \times N \times a_c + Z_{\alpha/2}^2 \pm Z_{\alpha/2}\sqrt{Z_{\alpha/2}^2 + 4 \times N \times a_c - 4 \times N \times a_c^{\,2}}}{2(N + Z_{\alpha/2}^2)}$$

1-α	Z
0.99	3
0.98	2.5
0.95	2
0.90	1.5

Under the condition of 2-standard deviations (95%), calculate the value of p for each one of the two samples (Ta-Hsin and Wei-Hsin). Explain if their conclusion was correct (or confident enough).