計算機概論 試題

注意事項

1. 本試題共【9】題，配分共 100 分。
2. 請按順序標明題號（大題及子題）作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。
4. 請掌握時間，回答問題務必切題、簡潔、精確，非必要的文句對得分並無幫助。

1. (a) A list is stored as an ordered binary tree for applying binary search algorithm. Draw the ordered binary tree for the list of letters B, E, G, H, J, K, N and P. Your choice of the root should be able to make the tree as balance as possible. (5%)
   (b) Redraw the tree if a new letter M is added to the list in (a). (3%)
   (c) Indicate the path traversed by the binary search algorithm when applied to the tree in (b) in searching for the letter J. (2%)

2. Explain the following terms precisely and concisely. The full (English) name must be provided in your answer if a term is given in its abbreviated form. (12%)
   (a) “CAM” in memory technology
   (b) RISC
   (c) Extranet
   (d) Proxy server

3. Answer the following questions:
   (a) What is the meaning of process starvation? (5%)
   (b) What is the meaning of polymorphism in OOP? (5%)

4. (a) What are the differences between virus and spyware? (4%)
   (b) What does the spam mean? (4%)
   (c) What are the differences between iterative structure and recursive structure in programming languages? (4%)

5. (a) Show how the array in Figure 1 would be arranged in main memory when stored in row-major order. Assume that the data are stored in the memory from high location (say,
x) to low location orderly. (5%)  

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 1 A 3x3 two-dimensional array.

(b) Similar to (a), give a formula for finding the entry in the $i$th row and $j$th column of an $n \times m$ two-dimensional array if it is stored in column-major order in the memory. (5%)

6. What is the three-step process in a machine cycle? Explain each step. (8%)

7. Compare the following terms from various aspects:
   (a) IPv4 versus IPv6? (5%)
   (b) TCP versus UDP? (5%)
   (c) Repeater versus Switch? (6%)

8. Design a BCD adder/subtractor in which the circuit has inputs of two BCD numbers and one control ($ctrl$). When $ctrl = 0$ (or 1), the circuit will perform BCD addition: $BCD#1 + BCD#2$ (or BCD subtraction: $BCD#1 - BCD#2$). Ignore the carry/borrow to the BCD adder/subtractor. You can use a 4-bit binary full adder as a building block (Figure 3). Draw the logic circuit of your design. (10%)

9. (a) $(3A5.AA)_{16} =$ ( ?)$_8$. (4%)
   (b) $110000 − 110101 =$ ? , using unsigned representation. (4%)
   (c) Convert $(78)_{10}$ to “6-4-1-1” code. (4%)