二元樹(Binary tree)的追蹤一般分成下列三種追蹤方式：
a. 前序追蹤(Preorder traversal) (2%)
b. 中序追蹤(Inorder traversal) (2%)
c. 後序追蹤(Postorder traversal) (2%)

試對下圖所示之二元樹資料分別作上述之三種追蹤

2. 某二元樹之前序為 ABCDEFG 而中序為 BCAEDGF
試畫出此二元樹 (4%)

3. 在布林代數數(Booolean Algebra)運算中,假定 A,B,C,D 自變數之值為 0 或 1: “+”代表 OR: “.”或不寫代表 AND: “−”代表 NOT,試化簡下列三題 (6%)
a. $\overline{ABC} + \overline{ABC} + ABC + \overline{ABC}$
b. $AB + \overline{AC} + AC + B\overline{C}$
c. $AB + \overline{AC} + DBC + D\overline{B}$

4. 近年來在人工智慧知識中有兩方法學：類神經網路與基因工程被大量的運用於資料群行之分析與預測,試描述此二方法學的定義與異同。(9%)

5. 試用 C-language 寫一程式, 產生 10 個變數且範圍在 1 至 6 範圍內。(5 分)

6. 試用 recursive call 寫一程式, 求兩數之最大公因數及最大公倍數。(5 分)

7. 試用 呼叫不同時間函數 寫一程式, 求 10 萬次的加、除、乘、除共需多少時間。(5 分)
5% 8.

試寫出下列程式執行結果。 (5 分)

main()
{
    struct rec
    {
        int item1;
        int item2;
    } t;
    int sub(struct rec *);
    int x;
    struct rec t;
    t.item1 = 1;
    t.item2 = 2;
    x = sub(&t) + sub(&t);
    printf("s = %d \n", x);
}

int sub(struct * r)
{
    r->item1 = 3;
    r->item2 = 4;
    return (r->item1 + r->item2);
}

9.

若串列如下，請寫出將指標 P 移動到最後一個節點之部份程式。 (4 分)

10. 5%

This is problem number 10. When solving problem 3, the method you used is generally not being used in industry. Why? Why then, all textbooks teach the logic minimization that way?

11. 6%

When solving problem 7, how would the (1) data types (2) CPU architecture (3) CPU clock rate each separately affects your result?

12. 6%

Explain (1) Bus, Bus arbitration (2) ISA bus, PCI bus (3) Hub, Why people need hubs?

13. 8%

A routing table was initially empty. How would it

be filled
14. Let $G$ represent a network of related multimedia contents including text, graphics, sounds, and video clips. Given the following assumptions. (i) $G$ is organized by nodes and associations between nodes referred to as directed links. Each node stores one type of multimedia content. (ii) If there is a directed link from node $X$ to node $Y$, then we say $X$ appears before $Y$. If $X$ appears before $Y$, and $Y$ appears before $Z$, then $X$ also appears before $Z$. (iii) A node may have several successors and predecessors. (iv) There is no cycle in $G$.

(a) (3%) Design a data structure to store the network $G$.

(b) (5%) Write an algorithm to produce a concatenation of all the video clips contained in $G$. The result should be ordering preserved, i.e., if video-$X$ appears before video-$Y$ in $G$, then video-$X$ should appear before video-$Y$ in the concatenation result. 

State any assumptions you make.

15. A hierarchical binary tree, $H$-tree, is defined as the following. (i) A $H$-tree contains two kinds of nodes, $P$-nodes and $Q$-nodes. $P$-nodes themselves form a binary tree structure. (ii) Each $P$-node on level $i$ of the binary tree structure points to a binary tree of depth $\leq i$ which having only $Q$-nodes (at most $2^i - 1$ $Q$-nodes), $i \geq 1$. (iii) The depth of a $H$-tree is equal to the depth of $P$-nodes’ binary tree structure.

Try to use a $H$-tree to define your own Hierarchical Binary Search Tree (HBST) which satisfies the following properties (constraints). (i) Every element has a unique key. (ii) Each $Q$-node stores an element’s data and key value. $P$-nodes can only be used to store key values. (iii) Each binary tree of $Q$-nodes is a binary search tree. (iv) . . . .

(a) (3%) What’s the maximum number of $Q$-nodes in a $H$-tree of depth $k$?

(b) (3%) State additional properties that your HBST may need to satisfy. What key values should be stored in $P$-nodes in order to facilitate the search on your HBST?

(c) (5%) Write an algorithm to search an element in your HBST.

16. (3%) CLAIM: “All software processes or paradigms go through the steps of the waterfall model either implicitly or explicitly”. Is this claim true or false? Explain your answer.

17. (3%) How do you do Verification and Validation (V&V) in the requirements analysis? Can you develop requirements specification without V&V? Why?