※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Three of the following statements are incorrect. Pick out and correct them.　(15 points)

   (A) An AVL tree is a binary search tree.

   (B) A B-tree of order 5 is a 2-3-4-5 tree.

   (C) To use binary search, sorted data must not be stored in a link list.

   (D) A max heap is a complete binary tree.

   (E) We use queue data structure to evaluate a postfis expression.

   (F) $n^3+1.01^n=O(n^3)$

2. The following array represents a complete binary tree. Adjust it to be a min heap by **showing each step**.　(15 points)

10	66	30	52	61	21	3	27	55	11

3. Suppose we are given the preorder sequence

   　　　A B C D E F G H I

   and the inorder sequence

   　　　B C A E D G H F I

   of the same binary tree.

   (a) Draw a binary tree defined by such a pair of sequences.　(10 points)

   (b) Does such a pair of sequences uniquely define a binary tree?　(5 points)

4. Consider the quick sort algorithm. True or false? Explain if false. (20 points)

   (a) The average-case time complexity of this algorithm is the same as that of the merge sort algorithm.

   (b) It is stable.

   (c) The worst-case time complexity of this algorithm is the same as that of the heap sort algorithm.

   (d) It is not suitable for external sorting.

   (e) The best-case time complexity occurs when the input data are already sorted.

5. Find the lengths of the shortest paths from vertex A to all remaining vertices in the following directed graph.　Generate the paths in ascending order of length.　(15 points)
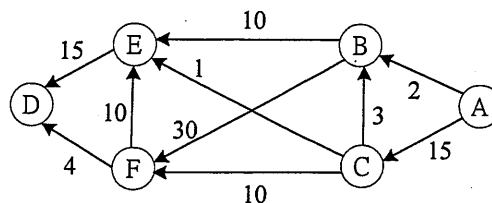
6. Consider a sequence of keys : 4, 7, 12, 15, 3, 5, 14, 18. Draw, **step by step** (showing clearly the type of rotation used), the result of inserting these keys into an empty AVL tree.　(20 points)