Problem 1 (2 points) Suppose $n$ people are arranged in a circle. Beginning with the person 1 we proceed around the circle and remove every second person (not counting removed persons). The last removed element is denoted by $J(n)$. Compute the number $J(2002)$.

Problem 2. (2 points) Solve Exercise 9-3.8 ($O(\log n)$ time computation of the median in a special case) from the textbook (page 193). Write the related algorithm in the pseudocode (informal programming language used in the textbook). Hint: Look at the relation between "middle elements".

Problem 3 (2 points) List the elements of the binary tree $T$ (given below) in the following four orders: (1) preorder, (2) inorder, (3) postorder, (4) level order.

```
  4
 / \ 
3   1
 / \  / \ 
5  2 7 9
 / \  / \ 
12 13 10 8 11
```

Problem 4. (2 points) Write a solution (sequence of 8 numbers, where the $i$-th number is the number of the man married with the $i$-th woman) to a stable marriage problem with list preferences given below for 8 men (denoted by capital letters) and 8 women (denoted by numbers). The lists are written vertically, the best preference at the top.

```
 A B C D E F G H
-----------------
2 1 5 1 3 5 1 1
4 2 1 5 4 3 5 2
1 4 3 4 5 6 3 3
3 6 4 2 6 2 2 6
8 5 6 7 8 1 6 5
7 8 7 3 1 4 4 4
6 3 8 6 2 7 7 8
5 7 2 8 7 8 8 7
```

```
1 2 3 4 5 6 7 8
-----------------
G F C B A E D B
A E B D E A G H
H G F E D C A A
F H G F B D B C
E B A H G F E D
D D D A C G H G
C C E C F H C F
B A H G H B F E
```