

Algorithm and Graph Review

1. Draw balanced heap trees for following lists of numbers
 - a. 1 4 8 6 20 15 4 9 21 35 67 5 7
 - b. 12 5 7 9 20 11 56 3 21 19
2. Draw balanced binary search trees for following lists of numbers
 - a. 1 4 8 6 20 15 4 9 21 35 67 5 7
 - b. 12 5 7 9 20 11 56 3 21 19
3. Write the function MergeSort(**A**, n) where **A** is an array of n real numbers.
4. Write a function to output all permutations of n elements:.

Example: $n = 3$

123, 132, 213, 231, 312, 321

5. Write a function to output all binary numbers of length n and the number of '1' digits is smaller or equal to the number of '0' digits.

Example: $n = 3$

000,001,010,100

6. Given a sequence of n integer numbers $A(1) \dots A(n)$, your task is to find the longest subsequence (not necessarily contiguous) in which the values in the subsequence form a strictly increasing sequence.

Example: 8 3 5 10 15 6 7 12 9 11 17 13 16

Output: 3 5 6 7 9 11 13 16

7. Given an undirected computer network with n nodes (numbered from 1 to n) and m edges, your task is to write a program to calculate the number of connected components that each contains at least three nodes.
8. Given n jobs (numbered from 1 to n) and m order requirements. Each order requirement is a pair of two jobs u and v indicating that job u must be done before job v . Your task is to write a program to order these jobs to fulfill the order requirements.
9. Given n cities (numbered from 1 to n) and m roads connecting cities. The traffic level between two cities u, v is $D[u, v]$. You have two tasks:
 - a. Write a program to find a path from a starting point s to the end point e such that the total traffic level on the path is the smallest.
 - b. Write a program to find the smallest traffic paths for all pairs of

10. Write a regular expression that matches these numbers:

- (123) 456 7899
- (123).456.7899
- (123)-456-7899
- 123-456-7899
- 123 456 7899
- 1234567899

11. Write a regular expression that validate strings of which:

- a. can consist of numbers, lowercase and uppercase characters.
- b. can consist of separators: hyphens, underscores, spaces.
- c. do not have two consecutive separators.
- d. do not have separators at the start or the end.