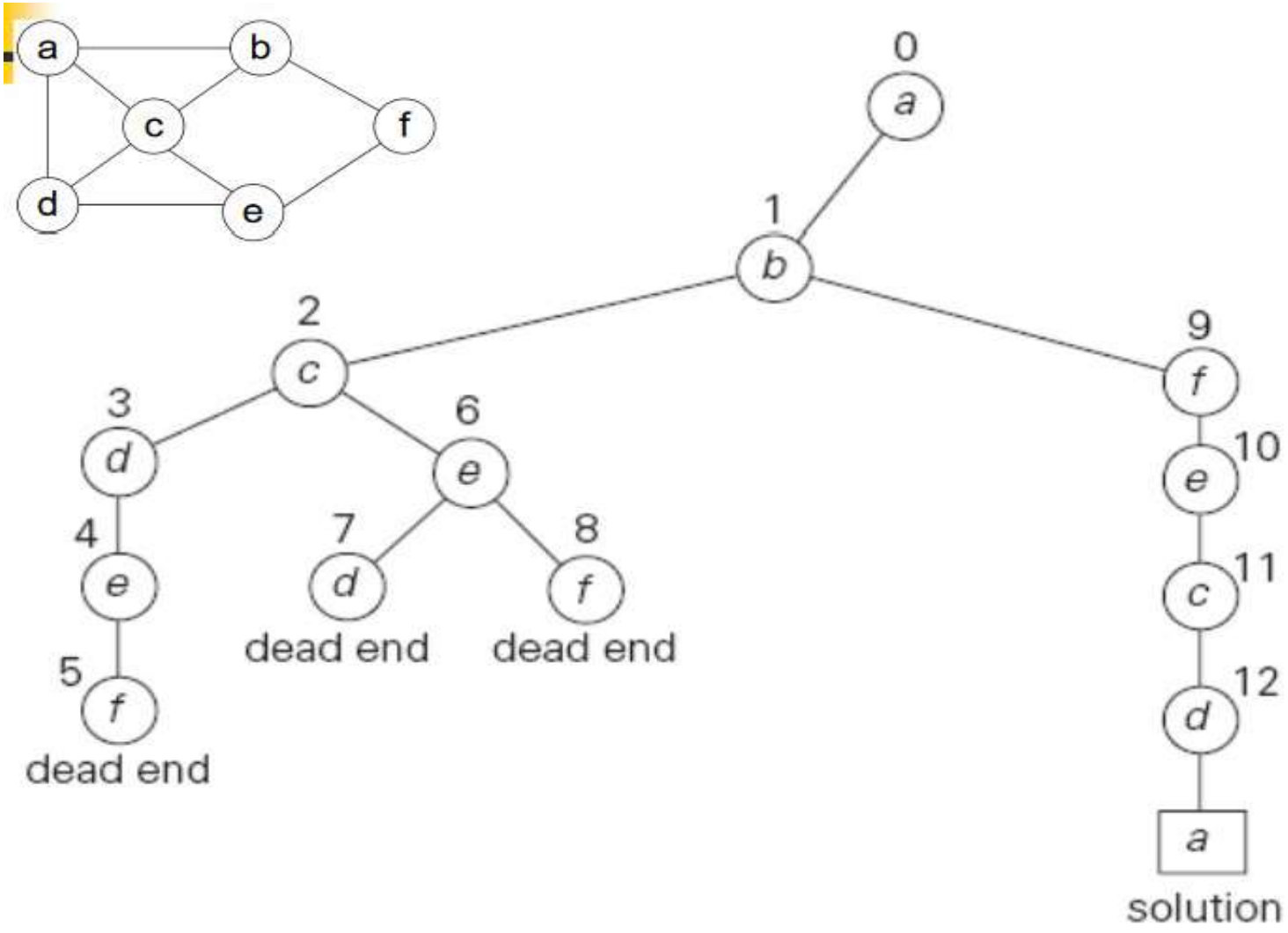
SNS COLLEGE OF TECHNOLOGY, COIMBATORE –35

Hamiltonian Circuit Problem, Subset Sum Problem

Hamiltonian Circuit Problem

- Hamiltonian circuit of a graph is a path that starts and ends at the same vertex and passes through all the other vertices exactly once.

Hamiltonian Circuit Problem



Subset Sum Problem

- The ***subset-sum problem*** is to find a subset of a given set $A = \{a_1, ..., a_n\}$ of n positive integers whose sum is equal to a given positive integer d.
- Example 1: $A = \{1, 2, 5, 6, 8\}$ and $d = 9$.
  - Solutions: {1, 2, 6} and {1, 8}
- Example 2: $A = \{1, 3, 4, 5\}$ and $d = 11$.
  - Solution: none
- Example 3: $A = \{3, 5, 6, 7\}$ and $d = 15$.
  - Solution: {3, 5, 7}

Subset Sum Problem

- We record the value of s, the sum of the first i numbers, in the node.
- If s is equal to d, we have a solution to the problem.
- We can either report this result and stop or, if all the solutions need to be found, continue by backtracking to the node's parent.

Subset Sum Problem

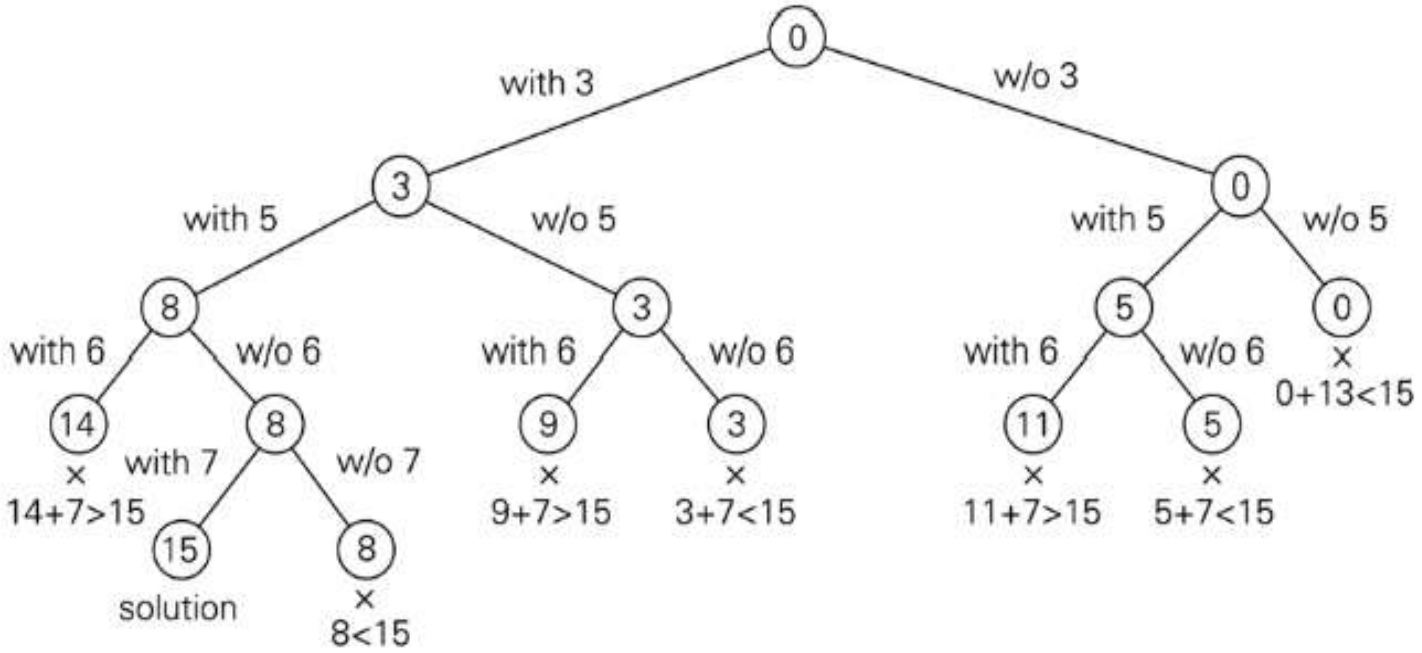
- If s is not equal to d, we can terminate the node as nonpromising if either of the following two inequalities holds:

$$s + a_{i+1} > d \text{ (the sum } s \text{ is too large)}$$

$$s + \sum_{j=i+1}^{n} a_j < d \text{ (the sum } s \text{ is too small)}$$

Subset Sum Problem

- Example: $A = \{3, 5, 6, 7\}$ and $d = 15$. Solution: $\{3, 5, 7\}$



State space tree (DFS)