

Construct the Huffman Code for the following data:

| symbol | A | B | C | D | – |
|-----------|------|-----|-----|-----|------|
| frequency | 0.35 | 0.1 | 0.2 | 0.2 | 0.15 |

Encode the text **DAD** and decode the text **10011011011101**

Solution:

First, we need to Construct Huffman tree by following below steps of Huffman algorithm:

Step1: Create 5- one node trees with symbol and its frequency as weight

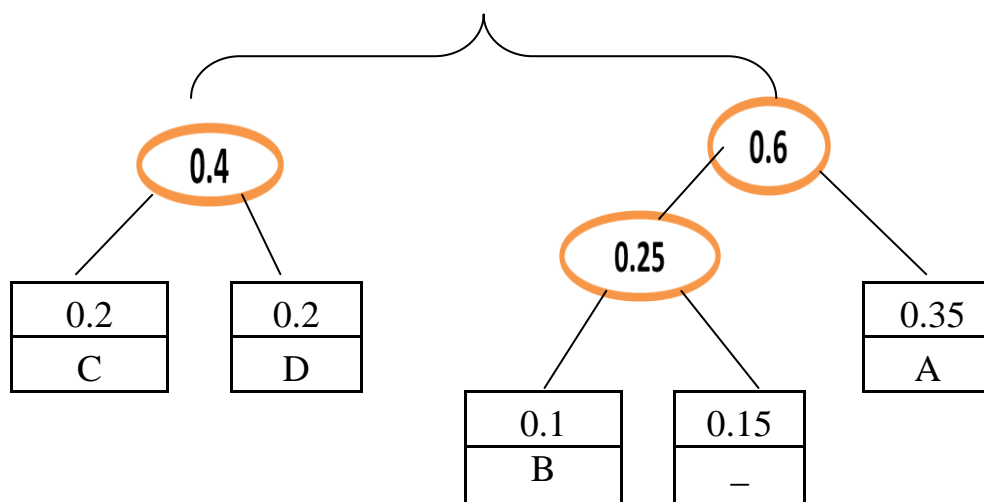
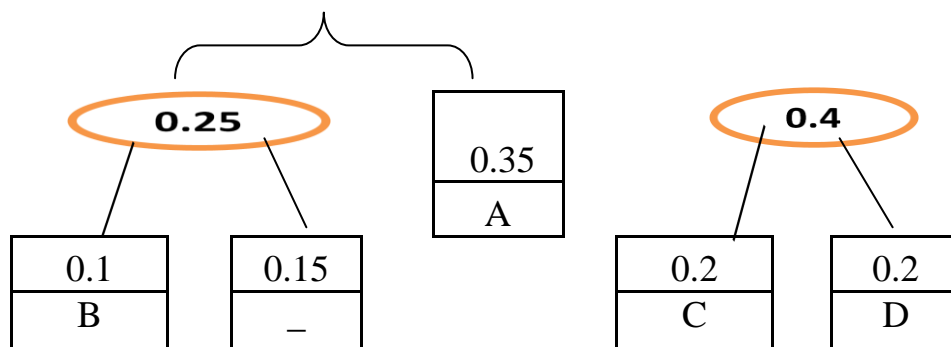
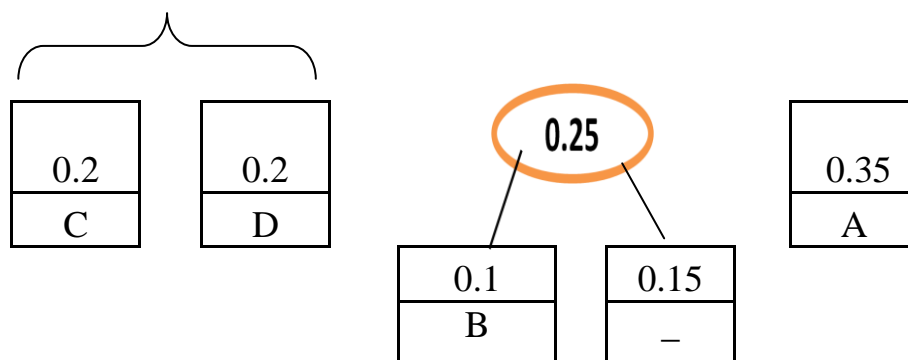
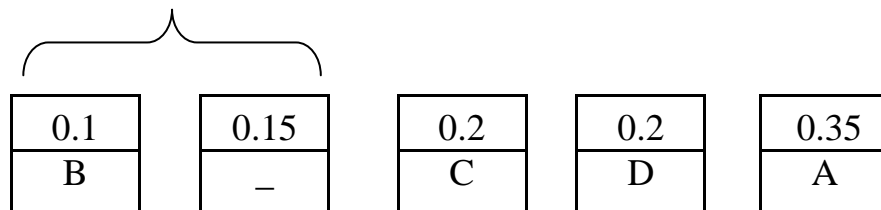
| | | | | |
|------|-----|-----|-----|------|
| 0.35 | 0.1 | 0.2 | 0.2 | 0.15 |
| A | B | C | D | – |

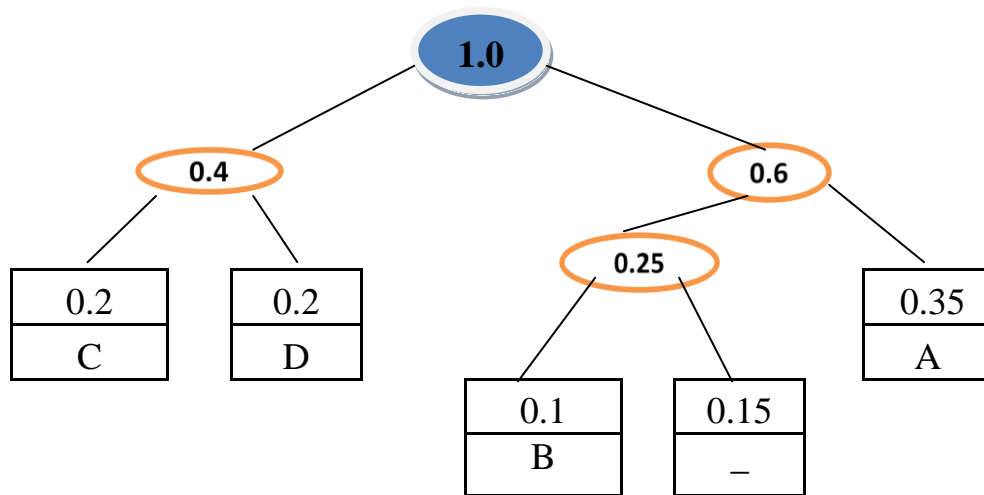
Step 2: Arrange the above nodes in ascending order of their weights

| | | | | |
|-----|------|-----|-----|------|
| 0.1 | 0.15 | 0.2 | 0.2 | 0.35 |
| B | – | C | D | A |

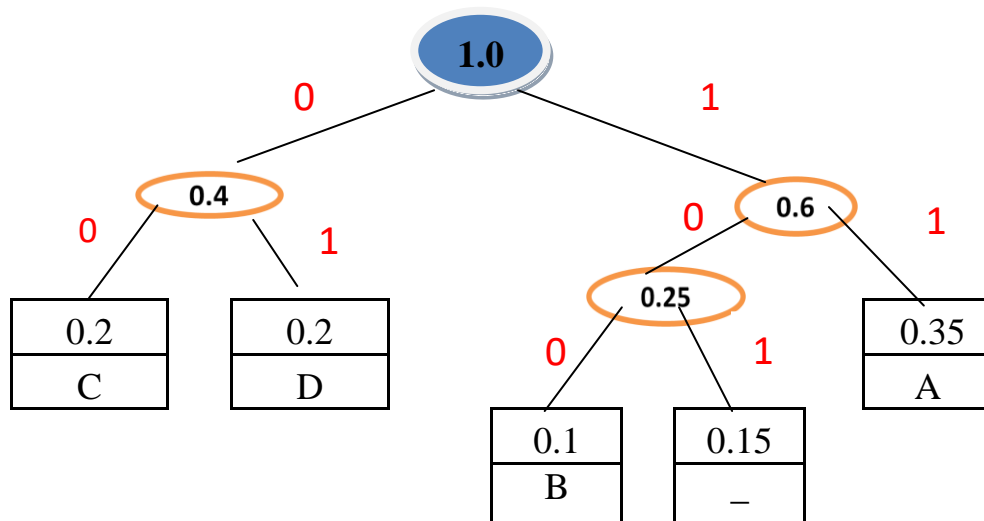
Step 3: Construct the Huffman tree by repeating the following operation until a single tree is obtained.

- Find two trees with the smallest weight.
- Make them the left and right subtree of a new tree and record the sum of their weights in the root of the new tree as its weight.
- Rearrange the nodes again in ascending order of weights





Now, Assign the label **0** to left edges and label **1** to right edges to the above Huffman tree to generate codeword.



✓ The codeword for the given symbol is as follows

| Symbol | A | B | C | D | - |
|----------|----|-----|----|----|-----|
| Codeword | 11 | 100 | 00 | 01 | 101 |

✓ Encode the text **DAD**, the bit string is **011101**

✓ **Decode the string 10011011011101**

| | | | | | |
|------------|-----------|-----------|------------|-----------|-----------|
| <u>100</u> | <u>11</u> | <u>01</u> | <u>101</u> | <u>11</u> | <u>01</u> |
| B | A | D | _ | A | D |

The text for the above string BAD_AD