Note (optional): It is suggested to write out the algorithmic details.

1. ([R], Page 770, Exercise 24) Use Huffman coding to encode these symbols with given frequencies: A: 0.10, B: 0.25, C: 0.05, D: 0.15, E: 0.30, F: 0.07, G: 0.08. What is the average number of bits required to encode a symbol?

Answer Area:

![Huffman Tree]

Average number: $3 \times 0.1 + 2 \times 0.25 + 4 \times 0.05 + 0.15 \times 3 + 2 \times 0.3 + 4 \times 0.07 + 0.08 \times 3 = 2.57$

2. ([R], Page 770, Exercise 26(a)(b)(exclude variance))

a) Use Huffman coding to encode these symbols with frequencies a: 0.4, b: 0.2, c: 0.2, d: 0.1, e: 0.1 in two different ways by breaking ties in the algorithm differently. First, among the trees of minimum weight select two trees with the largest number of vertices to combine at each stage of the algorithm. Second, among the trees of minimum weight select two trees with the smallest number of vertices at each stage.

b) Compute the average number of bits required to encode a symbol with each code.

Answer Area:

![Huffman Tree]

$\bar{n} = 0.4 \times 1 + 0.2 \times 2 + 0.2 \times 3 + 0.1 \times 4 + 0.1 \times 4 = 2.2$
\[ \bar{n} = 0.4 \times 1 + 0.2 \times 3 + 0.2 \times 3 + 0.1 \times 3 + 0.1 \times 3 = 2.2 \]