Homework3

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1 5.13

1.1

D = 4 and P = 4. The overhead for the tree is n3P = n12 and the total space for the tree is n(3P + D) = n16. So the overhead fraction is n12/n16 = 12/16= 3/4

1.2

D = 16 and P = 4. The overhead for the tree is n2P = n8 and the total space for the tree is n(2P + D) = n(8 + 16) = n24. So the overhead fraction is n8/n24 = 1/3

1.3

Let n be the number of internal nodes. By the Full Binary Tree theorem there are n + 1 leaves. So D = 8 and P = 4. The overhead for internal nodes is n3P = n12 and the overhead for the leaves is (n + 1)P = n4 + 4. The total overhead for the tree then is n12 + n4 + 4 = n16 + 4 = 4(n4 + 1). The total space for the internal nodes is n(3P + D) = n20 and the total space for the leaves is (n + 1)(P + D) = (n + 1)12. So the total space is n20 + n12 + 12 = n32 + 12 = 4(n8 + 3). The overhead fraction then is 4(n4 + 1)/4(n8 + 3) = (n4 + 1)/(n8 + 3).

1.4

Let n be the number of internal nodes. By the Full Binary Tree theorem there are n + 1 leaves. So D = 8 and P = 4. The overhead for internal nodes is n2P = n8 and the overhead for the leaves is 0. The total overhead for the tree then is n8 + 0 = n8. The total space for the internal nodes is n2P = n8 and the total space for the leaves is (n + 1)D = 8(n + 1). So the total space is n8 + n8 + 1 = n16 + 1. The overhead fraction then is n8/(n16 + 1).

1.5

1.5.1 120 :left 42 :right null

1.5.2 42 :left 2 :right 42

1.5.3 2 :left null :right 32

1.5.4 32 :left 24 :right 37

1.5.5 24 :left null :right null

1.5.6 37 :left null :right 40

1.5.7 40 :left null :right null

1.5.8 42 :left null :right null