# Homework 6

1. Prim’s Algo

|  |  |
| --- | --- |
| Tree Vertices | Not tree |
| A | B (A, 2), C (A, 5), D (A, 4), E ((-, -), F ((-, -), G ((-, -), H((-, -), I (-, -), J (-, -), K (-, -), L(-, -) |
| A, B(A) | C (A, 5), D (A, 4), E ((B, 3), F ((B, 6), G ((-, -), H((-, -), I (-, -), J (-, -), K (-, -), L(-, -) |
| A, B(A), E(B) | C (A, 5), D (E, 1), F ((E, 2), G ((-, -), H((-, -), I (E, 4), J (-, -), K (-, -), L(-, -) |
| A, B(A), E(B), D(E) | C (D, 2), F ((E, 2), G ((-, -), H((D, 5), I (E, 4), J (-, -), K (-, -), L(-, -) |
| A, B(A), E(B), D(E), C(D) | F (E, 2), G ((C, 4), H((D, 5), I (E, 4), J (-, -), K (-, -), L(-, -) |
| A, B(A), E(B), D(E), C(D), F(E) | G (C, 4), H((D, 5), I (E, 4), J (F, 5), K (-, -), L(-, -) |
| A, B(A), E(B), D(E), C(D), F(E), G(C) | H(G, 3), I (E, 4), J (F, 5), K (G, 6), L(-, -) |
| A, B(A), E(B), D(E), C(D), F(E), G(C), H(G) | I (E, 4), J (F, 5), K (G, 6), L(-, -) |
| A, B(A), E(B), D(E), C(D), F(E), G(C), H(G), I(E) | J (I, 3), K (G, 6), L(I, 5) |
| A, B(A), E(B), D(E), C(D), F(E), G(C), H(G), I(E), J(I) | K (G, 6), L(I, 5) |
| A, B(A), E(B), D(E), C(D), F(E), G(C), H(G), I(E), J(I), L(I) | K(G, 6) |
| A, B(A), E(B), D(E), C(D), F(E), G(C), H(G), I(E), J(I), L(I), K(G) |  |

1. Kruskal’s Algo

Edges: AB = 3, AC = 5, AD = 4, BE = 3, BF = 6, CD = 2, CG = 4, DH = 5, DE = 1, EI = 4, EF = 2, FJ = 5, GH = 3, GK = 6, HK = 7, HI = 6, IL = 5, IJ = 3, JL = 9, KL = 8

In Order: DE, CD, EF, AB, BE, GH, IJ, AD, CG, EI, DH, FJ, IL, BF, GK, HI, HK, KL, JL

Min Span Tree

A B



C D E F



G H I J



K L

1. Dijkstra’s Algo

|  |  |
| --- | --- |
| Tree Vertices | Shortest to A |
| A | B(3), C(5), D(4) |
| A, B | C(5), D(4), F(9), E(6) |
| A, B, D | C(5), E(5), F(9), H(9) |
| A, B, D, C | E(5), F(9), H(9), G(9) |
| A, B, D, C, E | F(7), H(9), G(9), I(9) |
| A, B, D, C, E, F | H(9), G(9), I(9), J(12) |
| A, B, D, C, E, F, G | H(9), I(9), J(12), K(15) |
| A, B, D, C, E, F, G, H | I(9), J(12), K(15) |
| A, B, D, C, E, F, G, H, I | J(12), K(15), L(14) |
| A, B, D, C, E, F, G, H, I, J | K(15), L(14) |
| A, B, D, C, E, F, G, H, I, J, L | K(15), |
| A, B, D, C, E, F, G, H, I, J, L, K |  |

A B



C D E F



G H I J



K L

1. Huffman Code
   1. Construct

B(.1) D(.15) \_ (.15) C(.2) A(.4)

\_ (.15) C(.2) (.25 (B and D) ) A(.4)

(.25 (B and D) ) (.35 (\_ and C) ) A(.4)

A(.4) (.6 (.25 (B and D) and .35 (\_ and C) )

1.0

A (.4) .6

.25 .35

B (.1) D (.15) \_ (.15) C (.2)

A = 0, B = 100, C = 111, D = 101, \_ = 110

* 1. Encode ABACABAD

0100011101000101

* 1. Decode 100 0 101 110 0 101 0

B A D \_ A D A

1. P, NP, and NP Complete Problems
   1. P, NP, and NPC are not all equal and so cannot be classified as one thing.
   2. P is a subset of NP and so isn’t equal, NPC is a subset of NP though so getting closer.
   3. P and NPC do not make up the entirety of NP and so drawing the line down the middle is ignoring the extra problems.
   4. NPC is a problem that can be broken down to a P problem but that doesn’t necessarily mean that there is overlap.
   5. This one seems good.
2. Decision Trees
   1. What is Infor-Theoretic lower bound?

It would take at most 3 decisions



* 1. Draw tree



A<B



B<C

A<C



A



A<C

B<C

A

C

B

C

B