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CS-225: Discrete Structures in CS

Homework Assignment 10

Exercise Set 10.7: Question # 14, 15

● Set 10.7 – Q#14

| Step | V(T) | E(T) | F | L (a) | L (b) | L (c) | L (d) | L (e) | L (f) | L (g) | L (z) |
|------|-------------------|---|-----------|-------|----------|----------|----------|----------|----------|----------|----------|
| 0 | {a} | \emptyset | {a} | 0 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| 1 | {a} | \emptyset | {b,e} | 0 | 1 | ∞ | ∞ | 4 | ∞ | ∞ | ∞ |
| 2 | {a,b} | {{a,b}} | {c,e,f} | 0 | 1 | 2 | ∞ | 4 | 8 | ∞ | ∞ |
| 3 | {a,b,c} | {{a,b}, {b,c}} | {d,e,f,g} | 0 | 1 | 2 | 3 | 4 | 8 | 10 | ∞ |
| 4 | {a,b,c,d} | {{a,b}, {b,c}, {c,d}} | {e,f,g,z} | 0 | 1 | 2 | 3 | 4 | 8 | 10 | 23 |
| 5 | {a,b,c,d,e} | {{a,b}, {b,c}, {c,d}, {a,e}} | {f,g,z} | 0 | 1 | 2 | 3 | 4 | 5 | 10 | 23 |
| 6 | {a,b,c,d,e,f} | {{a,b}, {b,c}, {c,d}, {a,e}, {e,f}} | {g,z} | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 23 |
| 7 | {a,b,c,d,e,f,g} | {{a,b}, {b,c}, {c,d}, {a,e}, {e,f}, {f,g}} | {z} | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | {a,b,c,d,e,f,g,z} | {{a,b}, {b,c}, {c,d}, {a,e}, {e,f}, {f,g}, {g,z}} | | | | | | | | | |

Thus the shortest path from a to z is aefgz, and has length $L(z)=7$.

● Set 10.7 – Q#15

| Step | V(T) | E(T) | F | L (a) | L (b) | L (c) | L (d) | L (e) | L (g) | L (z) |
|------|-------------|------------------------------|-----------|-------|----------|----------|----------|----------|----------|----------|
| 0 | {a} | \emptyset | {a} | 0 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ |
| 1 | {a} | \emptyset | {b,e,g} | 0 | 3 | ∞ | ∞ | 3 | 4 | ∞ |
| 2 | {a,b} | {{a,b}} | {c,e,g} | 0 | 3 | 10 | ∞ | 3 | 4 | ∞ |
| 3 | {a,b,e} | {{a,b}, {a,e}} | {c,d,g,z} | 0 | 3 | 10 | 14 | 3 | 4 | 7 |
| 4 | {a,b,e,g} | {{a,b}, {a,e}, {a,g}} | {c,d,z} | 0 | 3 | 10 | 14 | 3 | 4 | 5 |
| 5 | {a,b,e,g,z} | {{a,b}, {a,e}, {a,g}, {g,z}} | {c,d} | | | | | | | |

Thus the shortest path from a to z is agz, and has length $L(z)=5$.