**Lab 5 Solutions**

**Problem1A: Solution**

1. **Answer**: SSSXXSSXSXXX

A piece of paper with writing on it

Description automatically generated

1. **Answer**: This output is not possible because no sequence of pushes and pops operations can generate this output as per instructions. 2 will be pushed before 3, so 3 will be popped before 2 – therefore, the order of the last two digit of 154623 cannot be realized

**Problem1B: Solution**

There are nC2 pairs of keys that can collide, each pair can collide with probability 1/m if h is choosen at random from universal hash function H. Let X be a random variable that counts the number of collisions. So, the expected number of collisions is –

A white paper with black writing

Description automatically generated with low confidence

**Problem2: Solution**

|  |  |
| --- | --- |
| **Num nodes *n*** | **Does there exist a red-black tree with *n* nodes, all of which are black?** |
| 1 | Yes |
| 2 | No |
| 3 | Yes |
| 4 | No |
| 5 | No |
| 6 | No |
| 7 | Yes |

**Problem3: Solution**

|  |  |
| --- | --- |
| **Num nodes *n*** | **Does there exist a red-black tree with *n* nodes that has exactly one red node?** |
| 1 | No |
| 2 | Yes |
| 3 | No |
| 4 | Yes |
| 5 | Yes |
| 6 | No |
| 7 | No |