**Assignment 5 – Set, Hash, Map**

**Câu 1:**

Tính xác định duy nhất (tính tất định) và phân bố đều

**Câu 2:** Draw the 11-entry hash that results from using the hash function h(i) = (2i+5) mod 11 to hash keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, 5.

a) Assume collisions are handled by chaining.

b) Assume collisions are handled by linear probing.

Hash function: h(i) = (2i + 5) mod 11

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Key (i) | 12 | 44 | 13 | 88 | 23 | 94 | 11 | 39 | 20 | 16 | 5 |
| Hashing (h(i)) | 7 | 5 | 9 | 5 | 7 | 6 | 5 | 6 | 1 | 4 | 4 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 20 |  |  | 16  5 | 44  88  11 | 94  39 | 12  23 |  | 13 |

Index 1: [20]

Index 4: [16, 5]

Index 5: [44, 88, 11]

Index 6: [94, 39]

Index 7: [12, 23]

Index 9: [13]

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|  | 11 | 39 | 20 | 5 | 16 | 44 | 88 | 12 | 23 | 13 | 94 |

Hash table:

[0] 11

[1] 39

[2] 20

[3] 5

[4] 16

[5] 44

[6] 88

[7] 12

[8] 23

[9] 13

[10] 94

**Câu 3:** Draw the 17-entry hash that results from using the hash function h(i) = (i+3) mod 17 to hash keys 1, 3, 18, 8, 23, 35, 11, 36, 20, 16.

c) Assume collisions are handled by chaining.

d) Assume collisions are handled by linear probing

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Key (i) | 1 | 3 | 18 | 8 | 23 | 35 | 11 | 36 | 20 | 16 |
| Hash (h(i)) | 4 | 6 | 4 | 11 | 9 | 4 | 14 | 5 | 6 | 2 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|  |  | 16 |  | 1  18  35 | 36 | 3  20 |  |  | 23 |  | 8 |  |  | 11 |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|  |  | 16 |  | 1 | 18 | 3 | 35 | 36 | 23 | 20 | 8 |  |  | 11 |  |  |

**Câu 4:** File cau4.cpp