**Advanced Algorithms**

**Exercise for Lecture 7**

|  |  |  |  |
| --- | --- | --- | --- |
| **Student Name** |  | **Student ID** |  |
| **Problem 1** |  | | |
| **Problem 2** |  | | |
| **Problem 3** |  | | |
| **Total Score** |  | | |
| **Notes** | Deadline: **2023-10-07 24:00**  Submission Format: ‘**Lecture7\_Name\_Student ID.docx**’, and please send to: **[1914499454@qq.com](mailto:algorithms_23fall@163.com)**.  This assignment is meant to be an evaluation of your **individual** understanding coming into the course and should be completed **without collaboration** or outside help. | | |

**Problem 1.[30 points]** As a function of the minimum degree t, what is the maximum number of keys that can be stored in a B-tree of height h?

**Problem 2.[30 points]** Show the results of inserting the keys

F, S, Q, K, C, L, H, T, V, W, M, R, N, P, A, B, X, Y, D, Z, E

in order into an empty B-tree with minimum degree 2. Draw the configurations of inserting M, Y and the final configuration.

**Problem 3.[40 points]** The table below lists all possible 2-3-4 tree shapes that could resultfrom inserting N distinct keys into an initially empty tree using top-down insertion, for N between 1 and 6. The left column is the number of keys, the next column is the number of possible trees with that many keys, all of which are drawn on the right (with dots indicating the key values). Complete the two bottom rows of the table (draw the three trees with 5 keys and enter the count and draw the trees with 6 keys).

