IF.06.01 TINF Operating Systems – Free Blocks, Quotas – Exercises.

1. (10 %) **Free Blocks Management Using a Linked List** Consider a file system managing free blocks by using linked lists. The table below shows the final two blocks storing free blocks. Fill the empty tables below to show the changes which occur in the tables after the following scenarios. Highlight the changes using a color pencil.
   (a) Five new blocks are allocated
   (b) The block 22 is freed
   (c) Another 5 blocks are allocated
   (d) Another block is allocated
   (e) Another three blocks are allocated
   (f) Four blocks (23456, 8345345, 56, and 634534) are freed

| Block # | 17 | 18 |
|---|---|---|
| Next Block | 18 | 0 |
| | 4589 | 24353 |
| | 43546 | 98745 |
| | 718 | 76345 |
| | 345 | 9877 |
| | 23456 | 7345 |
| | 8345345 | 34535 |
| | 634534 | 154698 |
| | 3478 | 967 |
| | 56 | 8657 |

a)

| Block # | 17 | 18 |
|---|---|---|
| Next Block | 18 | 0 |
| | 4589 | 24353 |
| | 43546 | 98745 |
| | 718 | 76345 |
| | 345 | 9877 |
| | | 7345 |
| | | 34535 |
| | | 154698 |
| | | 967 |
| | | 8657 |

b)

| Block # | 17 | 18 |
|---|---|---|
| Next Block | 18 | 0 |
| | 4589 | 24353 |
| | 43546 | 98745 |
| | 718 | 76345 |
| | 345 | 9877 |
| | 22 | 7345 |
| | | 34535 |
| | | 154698 |
| | | 967 |
| | | 8657 |

c)

| Block # | 17 | 18 |
|---|---|---|
| Next Block | 18 | 0 |
| | | 24353 |
| | | 98745 |
| | | 76345 |
| | | 9877 |
| | | 7345 |
| | | 34535 |
| | | 154698 |
| | | 967 |
| | | 8657 |

| Block # | 17 | 18 | Block # | 17 | 18 | Block # | 634534 | 18 |
|---|---|---|---|---|---|---|---|---|
| Next Block | | 0 | Next Block | 18 | 0 | Next Block | 18 | 0 |
| d) | | 24353 | e) | | 24353 | f) | | 24353 |
| | | 98745 | | | 98745 | | | 98745 |
| | | 76345 | | | 76345 | | | 76345 |
| | | 9877 | | | 9877 | | | 9877 |
| | | 7345 | | | 7345 | | | 7345 |
| | | 34535 | | | 34535 | | | 34535 |
| | | 154698 | | | | | | 23456 |
| | | 967 | | | | | | 8345345 |
| | | 17 | | | | | | 56 |

2. **Free Blocks Management — Comparision** Given the two memory footprint scenarios for Free Blocks Management as presented in class. State the condition under which the linked list approach uses less space than the bitmap approach.

   **If you are using all of your space, the list is better, because the bitmap doesn't use the tables where the free blocks are saved effectively**