

Midterm Exam Summer II 2003 KEY

I.

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| 1. c | 6. e |
| 2. b | 7. c |
| 3. c | 8. b |
| 4. a | 9. a |
| 5. b | 10. d |

II.

- $T(n) = n - 1 + \log n$
- $T(n)$ is $O(n)$
 $T(n)$ is $\Omega(\log n)$

III.

- Let p be the size of a pointer in bytes: Array implementation uses $(3p)100=300p$ bytes, linked implementation uses $60(3p + p) = 240p$ bytes. Linked list is thus more space efficient in this case.
- Array more efficient when $n(\text{factor}) < c(\text{factor} + 1)$
Linked list more efficient when $n(\text{factor}) > c(\text{factor} + 1)$
- Revise code so that it checks if pos is closer to tail than to head. If so, start with $\text{fence} = \text{tail}$ and use previous pointer to reach position. (Can also check if pos is closer to current value of fence).
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Method	Array	Singly-Linked List	Double-Linked List
setpos()	$O(1)$	$O(n)$	$O(n)$
insert()	$O(n)$	$O(1)$	$O(1)$
append()	$O(1)$	$O(1)$	$O(1)$
prev()	$O(1)$	$O(n)$	$O(1)$

IV.

- Many answers (make sure all internal nodes have EXACTLY two children)
- I have no time to draw this electronically, but the leaves are B, D, F, and H
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60	52	30	10	47	28	7	5	9		
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- 16, 7, 3, 12, 50, 38, 90 (Other answers possible)