COP 5536 / AD 711R Advanced Data Structures

Instructor: Dr. Sartaj Sahni
Spring, 1999

Exam 1
Closed Book
1 Hour

February 1999
Take One Week After Lecture 12

Name: _____

SSN: _____

Site Number: _____

NOTE: All answers will be graded on correctness, efficiency, clarity, elegance and other normal criteria that determine quality. The points assigned to each question are provided in parentheses.

1. (10)

    (a) (5) In January, the ACME company buys a new machine which has a maintenance plan. The maintenance plan costs \$100 each month other than March, June, September and December (this covers a basic diagnostic check), \$200 every March, June and September (this covers a basic diagnostic check and re-calibration), and \$400 every December (which covers a detailed diagnostic check and re-calibration). Determine the amortized cost of this maintenance plan as a function of the number of months.

        Amortized cost for each month =

    (b) (5) Using the amortized cost calculated in part (a), fill in the following table.

| month	1	2	3	4	5	6	7	8	9	10	11	12
actual cost	100	100	200	100	100	200	100	100	200	100	100	400
amortized cost												
Potential()												

2. (10) In the first phase of external sorting, we wish to generate runs that are as long as possible. You are given an internal memory capable of holding 1900 records (and the program). Assume that a block is of length 250 records and we need two input and two output buffers.

    (a) (5) If we use a loser tree for k records to generate runs, what will be the maximum value of k?

(b) (5) In this example, is this loser tree approach better than simple sorting (before anything else DIRECTLY state yes or no)? Justify your answer.

3. (10) Consider the height-biased leftist trees below:

(a) (5) Compute shortest(x) for all nodes x (label the results on the respective nodes in diagram given).

(b) (5) Show the resulting height-biased leftist tree after the two trees are merged.
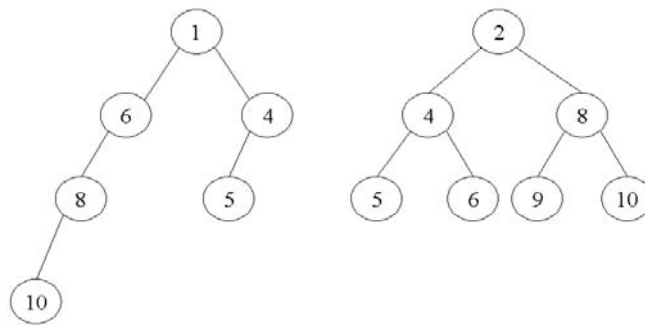
4. (10) Given the interval heap shown below, show the final interval heap produced by the following sequence of operations: insert(20), deleteMin(), deleteMax().

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                        (2,30)
                 (3,14)          (4,19)
            (4,12)    (3,11)  (5,15)   (6,16)
        (4,10)(5,11)(5,9)(4,7)
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