Background Quiz COMP 4804

January 2014, 15-20 mins

**Question 1:** What is the running time of the fastest algorithm for sorting \( n \) real numbers? Which algorithm achieves that?

**Question 2:** How fast one can search an element in a sorted array consisting of \( n \) real numbers?

**Question 3:** What is the maximum number of subsets you can form from a set consisting of \( n \)-elements?

**Question 4:** What is \( \log_2 64 \)?

**Question 5:** What is the time complexity of constructing a binary search tree on \( n \)-nodes?

**Question 6:** What is the sum of the series \( 1 + 2 + 3 + \cdots + n \)?

**Question 7:** What does the recurrence \( T(n) = 2T(n/2) + n \), where \( T(1) = 1 \), evaluates to?

**Question 8:** What does the recurrence \( T(n) = T(n/2) + 1 \), where \( T(1) = 1 \), evaluates to?

**Question 9:** Is it true that a graph on \( n \) vertices consisting of at least \( n \) edges can be a tree?

**Question 10:** What is the maximum number of edges that a simple connected undirected graph on \( n \) vertices can have? (Note: A graph is said to be simple, if for any pair of vertices there is at most one edge joining them.)

**Question 11:** Is \( \log_2 \frac{a}{b} = \log_2 a - \log_2 b \)?
Question 12: Can you find the middle element of a link list by a single scan? (A link list is specified by a pointer to the first element of the list, and each element knows what is the next element in the list. We do not know apriori how many elements are there in the list.)

Question 13: We have two algorithms for a problem. Algorithm A runs in $O(n^3)$ time and Algorithm B runs in $O(1.5^n)$ time. Which algorithm will you use for sufficiently large values of $n$?

Question 14: Is the set of languages that are recognized by a non-deterministic finite automata is identical to the set of languages recognized by a deterministic finite automata?

Question 15: How many comparisons are sufficient to merge two sorted lists $A$ and $B$, each consisting of $n$-real numbers, in a single sorted list?

Question 16: What is the probability of obtaining ‘Heads’ in each of the tosses, when a fair coin is tossed 5 times?

Question 17: What is the probability of obtaining at least one ‘Tail’, when a fair coin is tossed 5 times?

Question 18: State a couple of NP-Hard Decision Problems.

Question 19: Suppose that a decision problem $A$ is NP-Complete. How can this be used to prove a decision problem $B$ is NP-Hard?

Last 3 digits of your Id:
Which term you took
COMP 3804:
COMP 2804: