

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2016

B.Tech 4th Semester

COURSE CODE: 10B11CI411

MAX. MARKS: 15

COURSE NAME: Fundamentals of Algorithm

COURSE CREDITS: 4

MAX. TIME: 1 HR

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1 Apply heap sort on the following array: $\langle 13, 15, 8, 0, 23, 5, 12, 14, 7, 9 \rangle$. Count the number of comparisons performed in the above question. Explain the complexity of Heapsort algorithm.

[3+1+1=5 Marks]

Q2 a) Solve the following recurrence: $T(n) = 3T(n/3) + n/2$

[2 Marks]

b) Prove: $f(x) + g(x) = \Theta(\max(f(x), g(x)))$

[3 Marks]

Q3 Banks often record transactions on an account in order of the times of the transaction, but many people like to receive their bank statements with checks listed in order by check number. People usually write checks in order by check number, and merchants usually cash them with reasonable dispatch. The problem of converting time-of-transaction ordering is therefore the problem of sorting almost-sorted input. Argue that the procedure INSERTION-SORT would tend to beat the procedure MERGESORT on this problem.

[2 Marks]

Q4 Give an $O(n \log k)$ time algorithm to merge k sorted lists into one sorted list, where n is the total no. of elements in all input lists. (Hint: Use min-heap)

[3 Marks]