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(T-1 Examination Feb-2018)

B. Tech. 4TH Semester

COURSE CODE: 10B11CI411 MAX. MARKS: 15

COURSE NAME: Fundamental of Algorithms

COURSE CREDITS: 4 MAX. TIME: 1 Hrs

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

Q.1 Compare the order of growth of the following functions: (3)

(i) $\log_2 n$ and $\sqrt{n}$

(ii) $(\log_2 n)^2$ and $\log_2 n^2$.

Q.2

(a) Let f(n), g(n), e(n) and d(n) be four positive functions defined as follows:

i) $d(n) = O(f(n))$

ii) $e(n) = O(g(n))$

iii) $f(n) = O(g(n))$

Justify your answer for the followings either true or false with explanation:

i) $d(n) \neq O(g(n))$ (1)

ii) $d(n) + e(n) = O(f(n) + g(n))$ (1)

iii) $ad(n) = O(f(n))$ (1)

(b) Show that: $3\log n + \log \log n$ is $\Theta(\log n)$ (1)

Q.3 Solve the following recurrences:

i) $T(n) = 2T(n^{1/2}) + \log n$ (1)

ii) $T(n) = 2T(n/2) + n \log n$ using master method. (1)

iii) $T(n) = 3T(n/4) + cn^2$ using recursive tree method. (2)

Q.4

(a) Write the algorithms for in-place merge sort. What is recurrence relation for measuring time complexity and solve the recurrence using recursion tree method. (3)

(b) Is it possible to sort N numbers stored in linked list using Quick sort. If yes, then what will be the time complexity of quick sort in worst case? If not, then justify your answer. (1)