

Faculty of Computers and Information

Cairo University

Midterm Exam

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| Department: CS |  |  |
| Course Name: Algorithms | Date: 09 /04/2016 |
| Course Code: | Duration: 1 hours |
| Examiner(s): Dr/ Basheer Youssef | Total Marks: 45 |

Q1 (10 points)

What is time complexity of the following recursion function?

F (n) = n when n >=0 and n <=3

F (n) = F (n-1) + F (n-3) when n>3

Is there any method to reduce the time complexity of this function?

Q2 what is the time complexity T (n) of the nested loops below? For simplicity, you may assume that n is a power of 2. That is, n = 2k for some positive integer k. [8 points]

for (i = 1; i <= n; i++) {

j = n;

while (j > = 1){

< body of the while loop > //Needs Θ (1).

j = [j/2];

} }

Q3 For each algorithm listed below give its worst-case running time.[9 points]

1-Binary search 2- Insertion sort 3- Merge sort 4- count sort 5- heap sort 6-redblack tree.

Q4 what is the main different between skip list and binary search tree? And what is the best method? (5 points)

Q5 Using master method to solve (9 points)

1. T(n) = 4T(n/2) + n (4 points)
2. T(n) = 4T(n/2) + n2 (4 points)
3. T(n) = 4T(n/2) + n3 (4 points)

Q6 compute the following recurrence (4 points)

T(1) =50.

T(n) = 4T(n/8) +2n for n = 64.