## National University of Computer and Emerging Sciences, Lahore Campus



Course: Program: **Duration:** 

Section:

Exam:

Design & Analysis of Algorithms **BS (Computer Science)** 20 Minutes Paper Date: 21-Feb-2023

Quiz 1

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Course Code: Semester: **Total Marks:** 

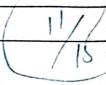
CS2009 Spring 2023

Weight Page(s):

Reg. No.

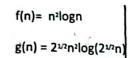
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Instruction/Notes:



## Question 1: [5 marks]

For the following functions f(n) and g(n), indicate whether f(n) = O(g(n)),  $f(n) = \Omega(g(n))$ , or both, i.e.  $f(n) = \theta(g(n))$ . Justify your answer.



Assuming we are taking log base of 2

Assuming we are taking log base of 2  $O(n) \Rightarrow f(n) \leq c \cdot g(n)$   $o(n) \Rightarrow f(n) = f(n)$   $o(n) \Rightarrow f(n) = f(n)$  o(n)

 $\frac{\log n}{\sqrt{2} \log (\sqrt{2}n)} \leq c$   $\frac{\log n}{\sqrt{2} \log (\sqrt{2}n)} \leq c$   $\frac{\log n}{\sqrt{2} \log (\sqrt{2}n)} \leq 3 \Rightarrow \text{if } n_0 = 10$   $\frac{\log n}{\sqrt{2} \log_2 (\sqrt{2}n)} = 1.202$   $\frac{\log n}{\sqrt{2} \log_2 (\sqrt{2}n)} = 1.202$   $\frac{\log n}{\sqrt{2} \log_2 (\sqrt{2}n)} = 0.5 \leq \frac{\log n}{\sqrt{2} \log_2 (\sqrt{2}n)}$ Assure c = 0.5  $\frac{\log n}{\sqrt{2} \log_2 (\sqrt{2}n)} = 0.5 \leq \frac{\log n}{\sqrt{2} \log_2 (\sqrt{2}n)}$ of the function  $f(n) = n/18 - 19n^{1/2} + 20$ , give the constants c = nof c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ of c = 100  $1 + n_0 = 5$ 

Question 2: [5 Marks]

Given:  $6.615 \le 3 + 20.615$ Find big-theta of the function  $f(n) = n/18 - 19n^{1/2} + 20$ , give the constants  $c_1$ ,  $c_2$ ,  $n_0$   $0.5 \le 0.581$ 

 $Q(n) = n/18 - 19n^{1/2} + 20$ An) & c.g(n) 1/18-19n/2+20 < c.gn

Assure C= 10 if no = 15 15/18 - 19 (15) 12+20 & 10 (15) (-52.8) 4 150

Therefore Q(n) 4 1 (n) justify.

if 12(n) => c.g(n) < f(n) c.n <= 1/18-19n1/2+

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## Question 3: [5 marks]

Write down the Running Time equation (T(n)) of the following algorithm and analyze its time complexity. Show complete steps. If you make any assumptions, state them clearly.

int algo(input, n)

If (n<=0)

{return 0}

X = algo(A, n/2)

Y = algo(A, n/4)

Z = A[(n/2) + (n/4) + 1]

return (X+Y+Z)

 $T(n) = T(\frac{n}{2}) + T(\frac{n}{4}) + (\frac{n}{4})$ 

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Time Complexity

loge no

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