	A20387	UC
chitrae	ta Singh	
	Assignment 1	
0,	restion 1	
	Problem 2.3-3	
	Prove: Ohen n is an excut power of 2, the solution of remerence	
	of 2, the solution of rewerence	
	T(n) = 52 (6 n = 2	
	(2) + n ib n=2k, for	
	K71	
	$P > T(n) = n \log n$	
4		
	Pago & :-	
	Base case: - When n = &	
	T(2) = 2 lg 2 = 2	
	By mathematical induction hypothesis	
	By mathematical induction hypothesis Suppose, $n = 90$ for $y 71$ we assume $T(n) = T(2^y) = 201929$ = $y \cdot 2^y$ .	
	= 4.24	
	Inductive steps.	
411	Oséng the above hypothesis, the	
	Oséng tre above hypothesis, the following is also true:	
	7(x) = 7(gy+1) = y gy+1. lggy+1	
	(C) = 1(20) - 2 2	

Que -1 continue:

í	
	45
	=(y+1)2y+1
1	
1 Larne	
651	6. $T(2^{y+1}) = 2T(2^{y+1}) + 2^{y+1}$
	· li-4 - 27 A paren
	⇒2T(29) + 24H.
	Since, T(25) 00 = 4.27
· Non	AND WALL WAS THE SERVER OF THE
- Almai	⇒ g.4.24 + gy+1
	5 4. 94t + 94th
With the land	39+1(4+1)
- smill II	$\Rightarrow 2.4.2^{9} + 29+1$ $\Rightarrow 4.2^{9} + 2^{$
of but	metalik masti saaku ilane alindan
10,0,04	so we can conclude 1200 pro
V	So, we can conclude from the above Phoof that T(n) = n lgn holds true for n = 2k and n = 2k+1 as well for K71
-171 ~	holds touch to make and magket
	as world bear K 71
	week per 1011
	(c) ) } . (m :
	50 000 18-21

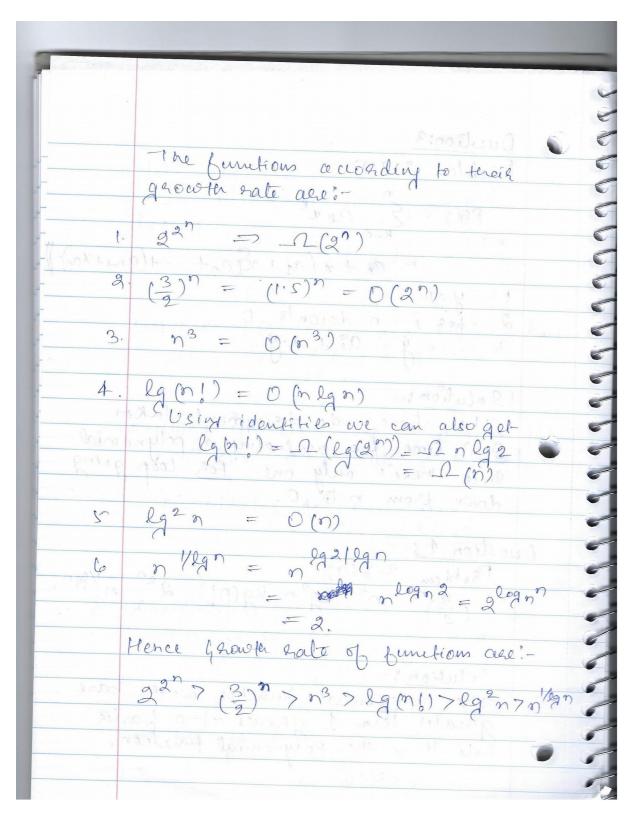
2.

-		
3		
3		
ppppppppppppppppppppppppppppppppppppppp	Que 2	Paoblem 2.3-4.
0		Busertion Sout: - In order to sout
0		A[1n], we recuesively sout A[1n-1]
3		and then insect A[n] into the souted
0		
0		array A [1n-1].
7		1 1 0 G + ( CS) P & G
7		Solution :- Value of Eggs and
-		the adgosithm well take constant
-		time o(1) if terese is only one element.
-		The first per
-		Por more teran one element tere algorie
-	(	would recursively sout A [1 n-1] items
-		which will take T[n-1] fine and to
ود		insection of the second of
-		insect A[n] elements into souted Array
0	145	It well take O(n) Line.
0		- I herefore the recurrence trelation is! -
0		15 X 2 2 Macy CD
0		
9		$T(n) = \{O(2), n=1,$
4		(TO-0+0(n) n>1
4		
-		
-		
5	9	
0		

## 3 and 4.

Occestion:3
Problem 2-3(a)
acknowly medited to go of portal forther popular
$P(n) = \sum_{k=0}^{n} a_k x^k$
(2)
= ao + n (ai + n (ag+ - + (an-1+xan)-
1 4=02)
2 for ê = n do conto 0
3 y = ai + n.y.
Solution: Copin 0 = Copin A
The above code bragment takes
O(n) time for evaluating a polynomial
Since trucés only one for loop going
down from n to 0.
Question 4:
Po. 1-1 2-2100
(3) n <sup>3</sup> lg <sup>2</sup> n lg(n!) 2 <sup>2</sup> n /gn.
Fren Caret and of sunder acci-
Solution :-
The lap on ential function we to base
greater teran 1 grows at a bastian.
I hate than the polynomial function.

Que- 4 Continue



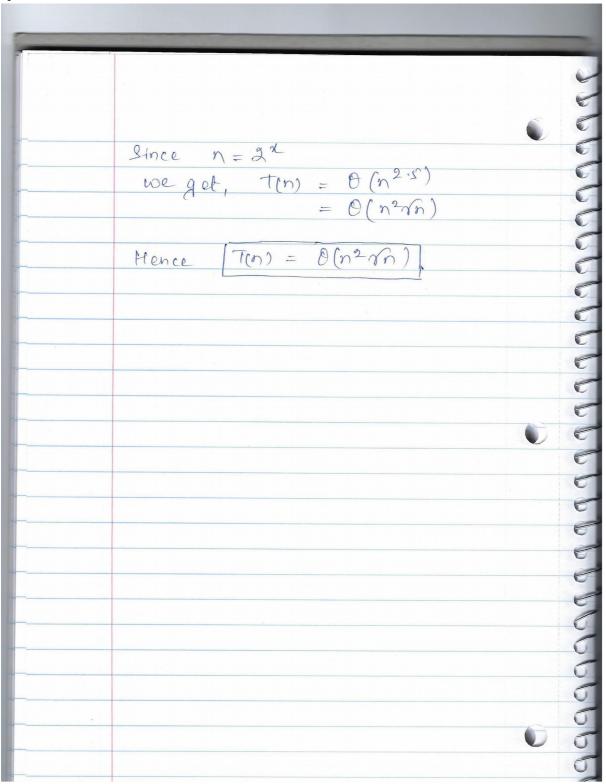
5.

Outstions:  Problem 4-3(c)  T(n) = $4T(n 2) + n^2 \sqrt{n}$ .  Master Theorem: $T(n) = aT(n b) + bm$ $a = 4, b = 2 b(n) = n^2 \sqrt{n}$ $= a b(n b) = 4(n x)^2 \sqrt{n} / 2$ $= 4 \cdot n^2 / 4 \sqrt{n} / 2$ $= 4 \cdot n^2 / 4 \sqrt{n} / 2$ Since $\sqrt{1}$ is $< 1$ , Theorem $\sqrt{2}$ in $\sqrt{2}$ in $\sqrt{2}$ .  By secondary Rememberce.  T(n) = $\sqrt{1}$ $\sqrt{2}$ $$		
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.		
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.		
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.	100	Martin C.
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.	-	
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.		120ben 7-3(c) 1000000000000000000000000000000000000
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.	L	$T(n) = 4T(n 2) + n^2\sqrt{n}$
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.	-3	TORE + CORPT = CALL
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	-3	Martin Thomas
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$		T(n) = aT(n b) + f(n)
Since of is < 1 Therefore In = Ogn)  By secondary Remedence.	1>0	or and the state of the state o
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	3	· · · · · · · · · · · · · · · · · · ·
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	-3	$\Rightarrow \alpha h(n b) - 4(n b)^2 \sqrt{n a}$
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	3 0	The second of th
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$		
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	3	
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	73	$\mathcal{N}^{2}\sqrt{n}$
Since $\sqrt{\frac{1}{2}}$ is $\sqrt{\frac{1}{1}}$ Therefore $\sqrt{\frac{1}{2}}$	73	$\frac{1}{\sqrt{2}}\sqrt{2}$
By secondary Remedence. $T(n) = 4 T(n/2) + n^2 \sqrt{n}$		Since II is < 1 Theretogo Ton Allon
By secondary Recurrence. $T(n) = 4T(n/2) + n^2 \sqrt{n}$	13	$= h^2 \sqrt{h}$
$T(n) = 1 + (n/2) + n^2 \sqrt{n}$	-	AN COLOR STATE
$T(n) = 1 + (n/2) + n^2 \sqrt{n}$	3	By Secondary Recurrence.
$T(n) = 4 T(n 2) + n^{2.5}$		
$T(n) = 4T(n 2) + n^{2.5}$	0	
(72(821)3	0	$T(n) = 4T(n 2) + n^{2.5}$
	T.	(78(81)3)

Que- 5 Continue

	: 2 miles (C)
	leté suppose n=2x
	Then the above In equation is all
	be come the above T(n) equation would
	$T(2^{x}) = 4 + (2^{x}) + 2^{3.5x}$
	T(22) = 4 T(22-1) + 22.5x
	tels take Trax - 1 + ma-1)
	Lets take $T(2^{x}) = t_x$ and $T(2^{x-1}) = t_{x-1}$ we get: $t_x = 4 t_{x-1} + 2^{2 \cdot 5 \cdot x}$
	lx-4 lx-1 - 22.5x=0-0.
	Applying left shift operation on above ego  lati - 4 la - 2252 =0 - 2
	·· lati - 4 la - 2250 =0 - (2)
	20 Annihilator por tx+1 - 41x
	= E(ta) - 4(ta)
001119	$= (E-4) \langle k_{\chi} \rangle$
0	b = (c - 4)
P	Annihilator for 22.5x = E-22.5
	Further we can rewrite eq $(2)$ as $(E-4)(E-2^{2.5})=0$
	$(E-4)(E-2^{2/5})=0$
	O.L.
	$T(n) = F(x) = \alpha_1 4^x + \alpha_2(2^{8.5})^x$
	We can neglect the lower order terms  30 F(x) = O((22.5)x)
	$= O((2^{\alpha})^{2/5})$

Que- 5 continue



## **HONESTY PLEDGE**

Illinois Institute of Technology Department of Computer Science

## Honesty Pledge

CS 430 Introduction to Algorithms Spring Semester, 2017

Fill out the information below, sign this sheet, and submit it with the first homework assignment. No homework will be accepted until the signed pledge is submitted.

I promise, on penalty of failure of CS 430, not to collaborate with anyone, not to seek or accept any outside help, and not to give any help to others on the homework problems in CS 430.

All work I submit will be mine and mine alone.

l understand that all resources in print or on the web, aside from the text and class notes, used in solving the homework problems must be explicitly cited.

Name (printed)

Signature

A 20387080 18th Jan 2017

Student ID Date