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CLASS ROII No :

32

SUBJECT :

SUBJECT CODE :

DESTAN AND ANALYSIS OF ALGORITHM

1cs 505

Angle Agymptotic notations are mathematical tools to represent the time complexity of algorithms for asymptotic analysis.

The main idea of asymptotic analysis is to have a measure of the efficiency of algorithms that don't depend on machine specific constants and doesn't require algorithms to be implemented and time taken by the programs to be compased.

Following are the asymptotic notations that are mostly

above and below, So it defines exact a symptotic

ii) Big O Notation: It defines an upper bound of an algorithm, it bounds or Function only from above.

111) Il Notation: Il Notation provides an asymptotic

Tor Example Consider Insertion Sort

It takes linear time in best case and quadratic time in and loss will can lay that Insestion Sout have Eighton of of afforthers for (En) Opholic configing O(n2) Foxy 000824 case to sold most no bondah trada tard form Rest Case Daniel and to suicable service of agod question of 1, 15 42 - securior solling of the interpretation of the police between the of Ang 3 = T(n) = { 3T(n-1), if n>0 principle of the swise T(n) = 3T (n-1) 3 (37 (n-2)) short ship a short of a short of a oilolding & D love con 3 Tet Ch-30 , wolld born sound The algorithm of the sound of t 37 T(n-n) (n) = 2 T(n-1) -1 15 mg 2 25 mg 3d T(n) = 2 T (n-1) + 11 otal 1 . noistain I = 22 (T(n-21)-2-1 old-cost sold = 22(27 (n-3)+1)2-2-1 896 205) 23 T (n-3) - 22-21-20 2"T(n-n)-2"-1-2"-2"-3" 2"-3"-2"

$$= 2^{n} - (2^{n} - 1)$$

$$= 2^{n} - 2^{n} + 1 = 1$$

If K is total to number of iterations taken by the brogram, then conile loop terminates 1+7+3+...+ K= [K(x+1)/2]>n

O (Th) Some (A) O

loop is executing logn times " 1 - (= = 1) + (1-11) | g - 2 - 1) | times

Ans s=

Ans 6=

Ang 8 =

0 (n3)

0(50)

n/a times n/a = n Time Complexity = 60 (n log2n)

Ang 9/45 = Inner loop will execute (n + \frac{n}{2} + \frac{n}{3} + \dots + \frac{n}{n}) $\eta \left(1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{\eta} \right)$

.. It is equal to O (nlagn)

Ans 10 = K>= 1 Taking K = a = 2 and promised were can day to n? = D(2k) pagam, the could look terminates $n^{K} = O(a^{n})$ $= X \left[\left((n \times) A \right] = X \right]$ O (In) Same logic which is given in Ques 5. (710 Relation & Bridges & good | Nug 12 = Recussence 23 mist(n) = F(n-1) + T(n-2) +1 Plaking Recussence Tree ((n3) Star a veries door our F. = EVI, But Tel= (+12+4+-1+27 3-1 = 3 Hel D(2+1) = D(2+2") = D(2")

Space Complexity = O(n) ANS IHE This is becouse maximum Stack Frame is equal to n only as function 18 called like this f(n-1) + .f(n-2) F(n-2) is called when we get the seturn value It is equal to och Ans 13= 1-5000 00100 n logn tox (1=1; icn; itt)=(1) For (j=1; j(=n; j=j+i)

printf("#"); n3 (24) 0 : (4) 1. Fox (i=1; icn; i++) Cos Chil 'Salwah quals was v CI X 7 FO8 (K=10; KKn; R++) baintf(" #"); Lag logn int fun (int n) (100) if (n <= 2)

else

return (fun (& floor (fart(n))) + n);

return!

T(n) = T(n/4) + T(n/2) + cn2 Ans 14= This is becouse maximum Stack for Son is edual to 21 odil bollas & mordsond & 1000 00 T(n/2) >= T(n/4) 30/100 months 3ml 100 300 months bollo 8; (8-11)?

T(n) = 2 T (n/2) + (cm2) 7 most? Applying Master's Plethod a=2 b=2 Angs 13. K= 10960 = 10928=1 apol a nk = h F(n) = (B2 (0) (0) .. (This 0 (m2) But as T(n) (= 0(n2) T(n) = 0 (n2) (iii . ~ >i . + = i) 80/ Ang 16= if K is a Constant greater than 1, Then T. C= O(log log n) a) 801 (H) // 169 467 601 Ang 17 = $T(n) = T\left(\frac{qqn}{100}\right) + T\left(\frac{n}{100}\right)$ Trans196 3 etusa ([un (\$ [1003 (Sustion) + 11)]

IF we take longer branch i.e 99n

Tec= (log log h = log n

We can say that the base of atgorn log does not

matter of constant.

p) I soglogn Jiogness (2n) as nig

c) 06 logger logger Sn logger stander nlogger 8n2 7n3

Ans 19= Linear Seasch (assay, key) for i in array return in Ang 20 = Iterative Insertion Sort and soul in Sestion Sost (ass, n) Loop from i=1 to i=n-1 ton 2001 por realto 70 oded Pick element assig and insert it into . I maland to soldom a line Losted Sequence ass [o. i-1] Jos (4) 181 Enl Mecuagine Ingertion South 1 18, 8, nlogn insertion Sort (arr, n) if n <= 1 an ac a actor abore abore aboretarn born ubarbor 1 (9 recursively Sout no element insection sort (ass, n-1) Pick Plast element aboli and insert it into Sorted Sequence aso [o. i-1]

Insertion Sort Considers one input element per iteration and produces a postial Solution without considering Future elements. Manadassol madassip) The is called portine Sorting. Algorithm X > I rad birath it Ans 20/21/22= Con Sidering only 3 Sorting Algo. till now, as we get the lectures of these 3 only. 1- jury thirn : boustesoft Algo Best Average Work S.C Stable Inplace Odi Case Case Bubble Sost 1-0(n2) 10 1000 x = 1+x1 O(n2) O(n2) 0(1) Time Complexity Selection Soul MO(my) soud one) (i) O (i) O(n2) Indestion Sort 0 (1) D(n2) (mgd) 0 (1) D(n2) (npg1)0 Ans 23= binary- Search (1) A - Sooted array n - Size of assay

while x not found

. (.v)T

X - Value to be Searched

Inscalion Lost Considers one input clement per Mexation if upper bound < lower bound bod res a pastial Solution without considering Exit: x does not exist maisagia guid Set mid point = 1000esbound + (upperbound-lowerbound)/2 if Asmid point] < x -25/15/00 Buy (Quor 111) Sell faires & lower point +1 Bet the County As fix these & Buly. upperbound = midpoint -1 abily 18081 Acmid boin 20 X 200 Stable Toplace On EXIT: X Found at midboint 1006512406 (54)0 Time Complexity (1m)0 Releation Sour (50) Space Comprexity Linear (1)0 O(n) ٥ دي (١٠) ٥ D(nc) Binasy Leasth (1) 0 (logn) (Recussive) O(logn) Ans 23 Binazy Seasch Dinasz- Scerch O (logn) (It esative) Breeze potone + 10 (1) 10 15 % -> W Ang 24 = T(n) = T(n/2) to Com - x bound for a still