Ege Ipekci

CS201 Homework 2

21902333

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My Computer’s Properties:

Model name: MSI GE 76 10UG

Processor: Intel(R) Core(TM) i7-10870H CPU @ 2.20GHz 2.21 GHz

Ram: DDR IV 32 gb 3200 Mhz

Graphics card: 8 gb Nvidia RTX3070

1) Algorithm 1 has a for loop inside which works n times due to it’s condition. Therefore, time complexity is equal to O(n).

2) a^i≡ 1(𝑚𝑜𝑑 𝑝) determines a number which can drastically reduce the proces of a^n when 𝑛 𝑚𝑜𝑑(𝑖) used. Therefore, the Algorithm2 ‘s time complexity is O(1) since n mod(i) makes the n’s size insignificant in the matter of time amount.

3) The algorithm 3 has an tree structure due to it’s recursion. n/2^k is equivalent of log n. Therefore, the time complexity is equal to O(log n).

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n | Algorithm 1 | | | Algorithm 2 | | | Algorithm 3 | | |
| p=101 | p=1009 | p=10007 | p=101 | p=1009 | p=10007 | p=101 | p=1009 | p=10007 |
| 106 | 43 | 42 | 33 | 0.005 | 2.31 | 1.16 | 150 | 150 | 130 |
| 2\*106 | 81 | 98 | 67 | 0.001 | 1.89 | 0.99 | 630 | 480 | 370 |
| 3\*106 | 110 | 128 | 100 | 0.005 | 0.94 | 0.66 | 870 | 760 | 570 |
| 4\*106 | 166 | 169 | 134 | 0.003 | 1.72 | 0.35 | 1060 | 890 | 840 |
| 5\*106 | 160 | 208 | 178 | 0.006 | 2.55 | 1.32 | 1310 | 1270 | 1120 |
| 6\*106 | 198 | 250 | 252 | 0.003 | 1.32 | 1.02 | 1580 | 1430 | 1440 |
| 7\*106 | 242 | 293 | 295 | 0.002 | 2.15 | 0.71 | 1750 | 1670 | 1660 |
| 8\*106 | 234 | 329 | 335 | 0.005 | 0.88 | 0.38 | 1970 | 1800 | 1870 |
| 9\*106 | 283 | 342 | 376 | 0.002 | 1.57 | 1.31 | 2180 | 2010 | 2020 |
| 107 | 332 | 390 | 411 | 0.005 | 2.24 | 0.99 | 2210 | 2090 | 2080 |





