

SIT320 — Advanced Algorithms

Credit Task 10: Algorithm Analysis

At the completion of the module (**Module 10: Algorithm Analysis**), you are required to fill a lesson by doing following activities.

Your tutor will then review your submission and will give you feedback. If your submission is incomplete they will ask you to include missing parts. They can also ask follow-up questions, either to clarify something, or to double check your understanding of certain concepts.

Task List

- **(0)** Provide a short overview of what you learned in the module. This should be based on your learning summary from lecture (seminar), module content on cloud Deakin, your interaction with Unit Chair/Tutors/Peers, your research in the library or the internet and/or your interaction with chatGPT (make sure to provide the prompts you use).
 - You summaries in C/D/HD tasks are more important than they are in P tasks. Make sure you provide a minimum one-page (11 sized font) summary that highlights your key take aways from this module.

- **(1)** Solve following recurrence using substitution method:

- $$T(n) = \begin{cases} nT(n-1), & \text{if } n > 1 \\ 1, & \text{if } n = 1 \end{cases}$$

- $$T(n) = \begin{cases} T(n-1) + \log n, & \text{if } n > 1 \\ 1, & \text{if } n = 1 \end{cases}$$

- $$T(n) = \begin{cases} 3T(n/2) + n, & \text{if } n > 1 \\ 1, & \text{if } n = 1 \end{cases}$$

- **(2)** Solve following recurrence using Master Theorem:

- $$T(n) = \begin{cases} T(\sqrt{n}) + \log n, & \text{if } n > 1 \\ 1, & \text{if } n = 1 \end{cases}$$

- **(3)** Solve following recurrence using recursion tree method:

- $$T(n) = 2T(n/2) + cn$$

- **(4)** We had a detailed analysis of select(A,k) problem in this module. Based on what you learned from this problem, analyse the complexity of Quick Sort Algorithm. Note, quick sort will lead to unbalanced sub-problems (much like select(A,k)) problem. You are expected to use either Akra-Baazi or induction method to solve the recurrence.