NATIONAL UNIVERSITY OF SINGAPORE
CS2040 – Data Structures and Algorithms
(Semester 1: AY2022/23)
ANSWER SHEET
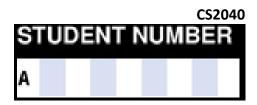
Section 1

Q1a [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q1b [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q1c [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q1d [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q1e [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q1f [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q1g [2]

◯ O(log(log(N))	◯ O(log(N))	◯ O((log(N))^2)	◯ O($\sqrt{N}$)	◯ O($\sqrt{N}$log(N))	◯ O(N)
◯ O(N log(N))	◯ O(N$^{1.5}$)	◯ O(N$^{1.5}$ log(N))	◯ O(N^2)	◯ O(N^2 log(N))	◯ O(N^3)

Q2 [3]

○ 0	○ 1	○ 2	○ 3	○ 4
○ up to twice …			○ to the moon!	

Q3 [3]

○ None	○ Ali only	○ Balu only	○ Charlie only
○ Ali & Balu only	○ Ali & Charlie only	○ Balu & Charlie only	○ Ali, Balu and Charlie

Q4 [3]

○ Disagree with all 3	○ Agree with X only	○ Agree with Y only	○ Agree with Z only
○ Agree with X, Y only	○ Agree with X, Z only	○ Agree with Y, Z only	○ Agree with X,Y,Z

Q5 [3]

○ Disagree with all 3	○ Agree with X only	○ Agree with Y only	○ Agree with Z only
○ Agree with X, Y only	○ Agree with X, Z only	○ Agree with Y, Z only	○ Agree with X,Y,Z

Q6 [3]

○ Disagree with all 3	○ Agree with X only	○ Agree with Y only	○ Agree with Z only
○ Agree with X, Y only	○ Agree with X, Z only	○ Agree with Y, Z only	○ Agree with X,Y,Z

Q7 [3]

○ Disagree with all 3	○ Agree with X only	○ Agree with Y only	○ Agree with Z only
○ Agree with X, Y only	○ Agree with X, Z only	○ Agree with Y, Z only	○ Agree with X,Y,Z

Section 2 [15]

Q8a

○ S1	○ S2	○ S3	○ S4	○ S5
○ S6	○ S7	○ S8	○ S9	○ S10

Q8b

○ $O(\log(\log(N))$	○ $O(\log(N))$	○ $O((\log(N))^2)$	○ $O(\sqrt{N})$	○ $O(\sqrt{N}\log(N))$	○ $O(N)$
○ $O(N \log(N))$	○ $O(N^{1.5})$	○ $O(N^{1.5} \log(N))$	○ $O(N^2)$	○ $O(N^2 \log(N))$	○ $O(N^3)$

Q9a

◯ S1	◯ S2	◯ S3	◯ S4	◯ S5
◯ S6	◯ S7	◯ S8	◯ S9	◯ S10

Q9b

◯ $O(\log(\log(N))$	◯ $O(\log(N))$	◯ $O((\log(N))^2)$	◯ $O(\sqrt{N})$	◯ $O(\sqrt{N}\log(N))$	◯ $O(N)$
◯ $O(N \log(N))$	◯ $O(N^{1.5})$	◯ $O(N^{1.5} \log(N))$	◯ $O(N^2)$	◯ $O(N^2 \log(N))$	◯ $O(N^3)$

Q10a

◯ S1	◯ S2	◯ S3	◯ S4	◯ S5
◯ S6	◯ S7	◯ S8	◯ S9	◯ S10

Q10b

◯ $O(\log(\log(N))$	◯ $O(\log(N))$	◯ $O((\log(N))^2)$	◯ $O(\sqrt{N})$	◯ $O(\sqrt{N}\log(N))$	◯ $O(N)$
◯ $O(N \log(N))$	◯ $O(N^{1.5})$	◯ $O(N^{1.5} \log(N))$	◯ $O(N^2)$	◯ $O(N^2 \log(N))$	◯ $O(N^3)$

Q11a

◯ S1	◯ S2	◯ S3	◯ S4	◯ S5
◯ S6	◯ S7	◯ S8	◯ S9	◯ S10

Q11b

◯ $O(\log(\log(N))$	◯ $O(\log(N))$	◯ $O((\log(N))^2)$	◯ $O(\sqrt{N})$	◯ $O(\sqrt{N}\log(N))$	◯ $O(N)$
◯ $O(N \log(N))$	◯ $O(N^{1.5})$	◯ $O(N^{1.5} \log(N))$	◯ $O(N^2)$	◯ $O(N^2 \log(N))$	◯ $O(N^3)$

Q12a

◯ S1	◯ S2	◯ S3	◯ S4	◯ S5
◯ S6	◯ S7	◯ S8	◯ S9	◯ S10

Q12b

◯ $O(\log(\log(N))$	◯ $O(\log(N))$	◯ $O((\log(N))^2)$	◯ $O(\sqrt{N})$	◯ $O(\sqrt{N}\log(N))$	◯ $O(N)$
◯ $O(N \log(N))$	◯ $O(N^{1.5})$	◯ $O(N^{1.5} \log(N))$	◯ $O(N^2)$	◯ $O(N^2 \log(N))$	◯ $O(N^3)$

Section 3

Q13a [2]

○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8	○ 9	○ 10

Q13b [2]

○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8	○ 9	○ 10

Q13c [2]

○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8	○ 9	○ 10

Q13d [2]

○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8	○ 9	○ 10

Q14a [2]

○ Sharp	○ Round

Q14b [2]

○ Tall	○ Short

Q14c [2]

○ Far	○ Near

Q14d [2]

○ Black & White	○ Grayscale	○ Colour	○ No image, what image?

Q15a [2]

○ Yes	○ No

Q15b [2]

○ Yes	○ No

Q15c [2]

○ Yes	○ No

Q15d [2]

○ Yes	○ No

Q15e [2]

○ O(N)	○ O(N^2)	○ O(N^3)	○ O(N^4)	○ Other worse polynomial time in N
○ Exponential in N		○ Factorial in N		○ Could be worse than O($N!$) even when …

Q16a [2]

○ O(N)	○ O(N log$N$)	○ O(N^2)	○ O(N^2 log$N$)	○ O(AN)	○ O(AN log$N$)
○ O($A N^2$)	○ O($A N^2$ log$N$)	○ O($A^2 N$)	○ O($A^2 N$log$N$)	○ O(A^2N^2)	○ O(A^2N^2 log N)

Q16b [2]

○ O(N)	○ O(N log$N$)	○ O(N^2)	○ O(N^2 log$N$)	○ O(AN)	○ O(AN log$N$)
○ O($A N^2$)	○ O($A N^2$ log$N$)	○ O($A^2 N$)	○ O($A^2 N$log$N$)	○ O(A^2N^2)	○ O(A^2N^2 log N)

Q16c [2]

○ O(N)	○ O(N log$N$)	○ O(N^2)	○ O(N^2 log$N$)	○ O(AN)	○ O(AN log$N$)
○ O($A N^2$)	○ O($A N^2$ log$N$)	○ O($A^2 N$)	○ O($A^2 N$log$N$)	○ O(A^2N^2)	○ O(A^2N^2 log N)

Q17 [1]

○ O(log$N$)	○ O($\sqrt{N}$))	○ O(N)	○ O(N log$N$)
○ O($N^{1.5}$)	○ O(N^2)	○ O(N^2 log$N$)	○ O(N^3)

BONUS (+3?)

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