

CSE 2321 WorkSheet 4 / Practicing for Exam 2

(Please do not share this with anyone)

March 18, 2022

Question 1.

[4 points] What is the worst-case time complexity of the program shown in the following algorithm? Justify your answer.

```
# include <stdio. h>
int int dinic(int x, int m)
int binary-search(int A[ ], int low, int high, int x);
int merge-sort(int A[ ], int first, int last);
// This line is left intentionally blank
main( )
{
    int A[0:n-1], m;
    A[n-1] = dinic(0,m);
    B = merge-sort(A[ ], 0, n-1);
    printf("Sorted array: \ n");
    return B;
}
// This line is left intentionally blank
int dinic(int x, int m)
{
    for (i = 1; i <= m; i*=2)
        x += binary-search(A[ ], 0, n-1, m);
    return x;
}
```

Question 2.

[1.5 points] Use the iteration method to solve the recurrence $T(n) = 5T(n - 1)$, where $T(0) = 3$.

Question 3.

[4.5 points] Use the recursion tree method to determine a good lower bound on each of the recurrence $T(n) = T(n/3) + T(2n/3) + cn$.

Question 4.

[5 points] Use the substitution-induction method to solve the recurrence $T(n) = 3T(n - 1) + 4$, where $T(1) = 1$.