CSE 3302/5307 Programming Language Concepts

Homework8 - Fall 2023

Due Date: Oct.21, 2023, 11:59p.m. Central Time

Problem1 - 25%

C has functions `malloc` and `free` that allow programmers to dynamically allocate and deallocate heap space. Research these two functions and compare their similarities and differences with the function `new` and `delete`.

Problem2 - 25%

Can you think of a better Mark-n-Sweep algorithm that reduces the amount of waiting time when garbage collecting?

Problem3 - 50%

Read the Java code program below and answer the question.

```java
Object[] p = new Object[2];
Object[] q = new Object[2];
Object[] s = new Object[2];
Object[] t = new Object[2];
p[0] = q;
p[1] = s;
q[0] = p;
q[1] = t;
s[0] = t;
s[1] = null;
t[0] = s;
t[1] = null;
for (int i = 0; i < 3; i++) {
s = new Object[2];
t = new Object[2];
s[0] = t;
s[1] = p;
t[0] = s;
t[1] = q;
p[1] = null;
```

```
q[1] = null;
p = s;
q = t;
}
```

(a) Show the configuration of memory cells under reference counting.(After the final step)

(b) Suppose we use mark-and-sweep GC on the same program, and the maximum heap size is 20 memory cells (one cell for one object). When GC action happens, and after GC, what is the configuration of the memory?