CS383 Quiz 3

Solution

1. About runtime stack, which one is incorrect?

a. The stack grows and shrinks as a process runs.

b. The stack is used to hold activation records. (29%)

c. For a function that has more statements, its stack frame should be larger. (58%)

d. A function's stack frame exists as long as the function is active.

2. Which rule is incorrect?

a. $$\frac{(M, e) \rightarrow (M', e')}{(M, \text{ref } e) \rightarrow (M', \text{ref } e')} \text{ (E - Ref)}$$

b. $$\frac{l \notin \text{dom}(M)}{(M, \text{ref } v) \rightarrow ((M, l \mapsto v), l)} \text{ (E-RefV)}$$

c. $$\frac{(M, e) \rightarrow (M', e')}{(M, !e) \rightarrow (M', !e')} \text{ (E - DeRef)}$$

d. $$\frac{}{(M, !l) \rightarrow (M, l)} \text{ (E-DeRefLoc)}$$ (83%)

3. About the disadvantages of the mark-and-sweep GC algorithm, which is incorrect?

a. Normal execution must be suspended.
b. May touch all virtual memory pages. (25%)
c. Fail to detect inaccessible circular structure. (75%)
d. Heap may fragment.

4. Which rule is incorrect?

a. $$\frac{(M, e_1) \rightarrow (M', e_1')}{(M, e_1 := e_2) \rightarrow (M', e_1' := e_2)} \text{ (E - Assign1)}$$

b. $$\frac{(M, e_2) \rightarrow (M', e_2')}{(M, v_1 := e_2) \rightarrow (M', v_1 := e_2')} \text{ (E - Assign2)}$$ (21%)

c. $$\frac{}{(M, l := v) \rightarrow (M[l \mapsto v], v)} \text{ (E-Assign)}$$ (50%)

d. All of them are correct. (25%)

5. Which is not a major area of the memory?

a. static area
b. heap
c. free list (100%)
d. runtime stack

6. Which rule is incorrect?

a. $$\frac{\Sigma;\Gamma \vdash e_1 : t \quad \Sigma;\Gamma \vdash e_2 : t}{\Sigma;\Gamma \vdash e_1 := e_2 : \text{unit}} \text{ (T-Assign)}$$ (58%)

b. $$\frac{\Sigma;\Gamma \mid - e : t\ \text{ref}}{\Sigma;\Gamma \mid - !e : t} \text{ (T - Deref)}$$

c. $$\frac{\Sigma;\Gamma \mid - e : t}{\Sigma;\Gamma \mid - \text{ref}\ e : t\ \text{ref}} \text{ (T - Ref)}$$ (17%)

d. $$\frac{\Sigma(l) = t}{\Sigma;\Gamma \mid - l : t\ \text{ref}} \text{ (T - Loc)}$$ (25%)

7. What is not in the activation records?

on the stack

a. Reference counters (21%) on the heap
b. Temporary variables
c. Parameters and local variables (21%)
d. Saved registers (58%)

8. Which rule is incorrect?

a. $$\frac{(M, e_1) \rightarrow (M', e_1')}{(M, e_1; e_2) \rightarrow (M', e_1'; e_2)} \ (E\text{-}Seq1)$$

b. $$\frac{}{(M, (); e) \rightarrow (M, e)} \ (E\text{-}Seq2)$$

c. $$\frac{\Sigma; \Gamma \mid\!- e_1 : unit \quad \Sigma; \Gamma \mid\!- e_2 : t}{\Sigma; \Gamma \mid\!- e_1; e_2 : t} \ (T\text{-}Var)$$ (25%)

d. All of them are correct. (63%)

9. Which rule is incorrect?

a. $\dfrac{}{\text{try v with e} \rightarrow \text{v}}$ (E - TryV) (25%)

b. $\dfrac{}{\text{try error with e} \rightarrow \boxed{\text{error}}}$ (E-TryError) (42%)

c. $\dfrac{e_1 \rightarrow e_1'}{\text{try } e_1 \text{ with } e_2 \rightarrow \text{try } e_1' \text{ with } e_2}$ (E - Try) (25%)

d. $\dfrac{\Gamma \mid\!- e_1 : t \quad \Gamma \mid\!- e_2 : t}{\Gamma \mid\!- \text{try } e_1 \text{ with } e_2 : t}$ (T - Try)

10. Which statement about run-time call stack is incorrect?

a. When a called function returns control to the caller, its activation record is removed from the stack.

b. The activation records are removed in the same order in which they are pushed onto the stack.

c. Many activation records can be active on the run-time stack at any time.

d. Each activation record contains a static link to the global variables.