MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science
6.001—Structure and Interpretation of Computer Programs
Spring Semester, 2005

Quiz II

NAME: Sample Solutions

Part 1: (25 points)

Question 1:

(define (rotate-left cycle)
  (cdr cycle))

Question 2:

(define (rotate-right cycle)
  (define (aux where start)
    (if (eq? (cdr where) start)
      where
      (aux (cdr where) start)))
  (aux cycle cycle))

Question 3:

(define (insert-cycle! new cycle)
  (let ((new-cell (list new)))
    (set-cdr! new-cell cycle)
    (set-cdr! (rotate-right cycle) new-cell)
    'done))

Question 4:

(define (delete-cycle! cycle)
  (set-cdr! (rotate-right cycle) (rotate-left cycle))
  (set-cdr! cycle '())
  'done)

Part 2: (30 points)

Question 5:
<table>
<thead>
<tr>
<th>E1</th>
<th>Enclosing environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E2</th>
<th>GE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3</td>
<td>GE</td>
</tr>
<tr>
<td>E4</td>
<td>E1</td>
</tr>
</tbody>
</table>

**Question 6:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Environment</th>
<th>Value to which bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>set!-start</td>
<td>GE</td>
<td>P1</td>
</tr>
<tr>
<td>set!-careful</td>
<td>GE</td>
<td>P3</td>
</tr>
<tr>
<td>val</td>
<td>E2</td>
<td>5</td>
</tr>
<tr>
<td>foo</td>
<td>GE</td>
<td>P4</td>
</tr>
<tr>
<td>new</td>
<td>E4</td>
<td>(10)</td>
</tr>
<tr>
<td>action</td>
<td>E4</td>
<td>new</td>
</tr>
<tr>
<td>var</td>
<td>E3</td>
<td>P4</td>
</tr>
<tr>
<td>val</td>
<td>E3</td>
<td>10</td>
</tr>
<tr>
<td>current</td>
<td>E1</td>
<td>10</td>
</tr>
</tbody>
</table>

**Question 7:**

Location: **E2**

Value: (5)

**Part 3 (15 points)**

Question 8: A

Question 9: K

Question 10: H

Question 11: G

Question 12: J

**Part 4 (30 points)**
Question 13.

2

Question 14.

no method

Question 15.

'SHEETS (lambda ()
    (fold-right + 0
        (map (lambda (thing) (ask thing 'SHEETS))
            contents)))

Question 16.

110

Question 17.

0

Question 18.

110

Question 19:

(define (aged-cabinet self name)
    (let (((cabinet-part (cabinet self name)))
        (age 0))
        (make-handler
            'aged-cabinet
            (make-methods
                'ADD-THING (lambda (thing)
                    (if (<= age 4)
                        (begin
                            (ask cabinet-part 'ADDTHING thing)
                            (set! age (+ age 1)))
                            'broken))
            cabinet-part)))

Question 20:

(define (located-cabinet self name x y)
    (let (((cabinet-part (cabinet self name)))
        (located-object-part (located-object self x y)))
        (make-handler
            'located-cabinet
            (make-methods)
            cabinet-part located-object-part)))
Question 21:

(lambda (new) (display "'My location has changed.'")
  (ask located-object-part 'set-x! new))

Question 22:

NO

'SET-X-Y! (lambda (newx newy) (ask self 'set-x! newx)
  (ask self 'set-y! newy))