Programming Languages (CS 329) **Homework 2**
Computer Science and Engineering **Out: 2000-10-06**
Indian Institute of Technology Bombay **Due: 2000-10-21**

1. Write down the denotation of the store-modifying language constructs in FLK! (`new`, `read` and `write`) using standard semantics (i.e., continuations). The semantic accessors ($\underline{\text{new}}$, $\underline{\text{read}}$ and $\underline{\text{write}}$) discussed earlier in class can be reused.

2. In statically scoped FLK, we defined

$$Proc \quad = \quad DenotVal \rightarrow ExpVal,$$

whereas for dynamic scoping we changed it to

$$Proc \quad = \quad DenotVal \rightarrow Env \rightarrow ExpVal.$$

Can you develop an alternative notation that will let you retain the original signature of *Proc* by making minor modifications to the $\mathcal{E}$ function?

3. Evaluate the following expression, indicating important steps that affect the current continuation:

```
(call-with-current-continuation
  (lambda (exit)
    (for-each (lambda (x)
                (if (negative? x)
                    (exit x)))
              '(54 0 37 -3 245 19))
    #t))
```

`for-each` is like `mapcar`.

4. Complete the definition of the CPS conversion function for the `callcc` construct. Use it to first fully convert, and then evaluate the expression:

```
(+ 1 (callcc (proc (c) (+ 2 (c 3)))))
```

which should evaluate to 4.