1993 Paper 11 Question 2

Common Lisp

You are asked by your manager to write a Lisp macro, `itercall`. Evaluating (`itercall` *F* *E*) evaluates *E*, which is expected to yield a non-negative integer *n*. It then executes the function calls (*F* `1`), ..., (*F* *n*) in succession, and returns `nil`.

(*a*) Your first version of the macro expands to a loop, which uses the symbol `i` as an index variable and the symbol `n` to store the initial value of *E*. Present the code for this version. [5 marks]

(*b*) Your manager complains that the function

```
(defun test1 (i) (itercall (lambda (x) (print (cons x i))) 10))
```

does not work as expected. Explain the problem and suggest how to fix it by modifying the macro. [4 marks]

(*c*) Your manager requests a final modification: (`itercall` *F* *E*) should generate straight-line code instead of a loop provided *E* is an integer constant less than twenty. Present the code for this version. Will it run faster than the previous versions? [11 marks]

Note: (`integerp` *x*) tests whether *x* is an integer. Each time (`gensym`) is called, it returns a new symbol not previously used in the Lisp system.