

## Laborator 5

### COMBINATORI DE PUNCT FIX. STREAM-URI

#### Cateva probleme rezolvate

1. Scrieti o functie care calculeaza factorialul unui numar natural folosind un combinator de punct fix.

**R:**

```
(define c1
  (lambda (f)
    ((lambda (g) (lambda (x) (f (g g) x)))
     (lambda (g) (lambda (x) (f (g g) x))))))
```

```
(define fact1
  (c1 (lambda (cont n)
        (if (= n 0)
            1
            (* n (cont (- n 1)))))))
```

```
(fact1 5)
```

2. Scrieti o functie care concateneaza doua liste folosind un combinator de punct fix.

**R:**

```
(define c2
  (lambda (f)
    ((lambda (g) (lambda (x y) (f (g g) x y)))
     (lambda (g) (lambda (x y) (f (g g) x y))))))
```

```
(define conc1
  (c2 (lambda (cont l1 l2)
        (if (null? l1) l2
            (cons (car l1) (cont (cdr l1) l2))))))
```

```
(concl '(1 2 3) '(4 5 6))
```

3. Scrieti un program care sa reintoarca lista numerelor naturale  $\leq 30$ .

**R:**

```
(define succ (lambda (n) (+ n 1)))
```

```
(define make_naturals  
  (lambda (k)  
    (cons k (lambda() (make_naturals (succ k))))))
```

```
(define naturals_stream (make_naturals 0))
```

```
(define take  
  (lambda (n stream)  
    (if (= n 0)  
        '()  
        (cons (car stream) (take (- n 1) ((cdr stream)))))))
```

```
(take 31 naturals_stream)
```

4. Scrieti un program care sa reintoarca lista numerelor  $\leq 100$  cu suma cifrelor numar prim.

**R:**

```
(define sumCifre  
  (lambda (n)  
    (if (= n 0)  
        0  
        (+ (modulo n 10) (sumCifre (quotient n 10))))))
```

```
(define isPrim  
  (lambda (n i)  
    (if (< n 2)  
        #f  
        (if (> i (quotient n 2))
```

```

      #t
      (if (= (modulo n i) 0)
          #f
          (isPrim n (+ i 1))))))

(define succ (lambda (n) (+ n 1)))

(define make_naturals
  (lambda (k)
    (cons k (lambda() (make_naturals (succ k))))))

(define naturals_stream (make_naturals 0))

(define take
  (lambda (n stream)
    (if (= n 0)
        '()
        (if (isPrim (sumCifre (car stream))) 2)
            (cons (car stream) (take (- n 1) ((cdr stream))))
            (take (- n 1) ((cdr stream))))))

(take 100 naturals_stream)

```

5. Scrieti un program care sa reintoarca lista numerelor perfecte  $\leq 1000$ .

**R:**

```

(define sumDivizori
  (lambda (n i)
    (if (> i (quotient n 2))
        0
        (if (= (modulo n i) 0)
            (+ i (sumDivizori n (+ i 1)))
            (sumDivizori n (+ i 1))))))

(define succ (lambda (n) (+ n 1)))

```

```
(define make_naturals
  (lambda (k)
    (cons k (lambda() (make_naturals (succ k))))))

(define naturals_stream (make_naturals 1))

(define take
  (lambda (n stream)
    (if (= n 0)
        '()
        (if (= (car stream) (sumDivizori (car stream) 1))
            (cons (car stream) (take (- n 1) ((cdr stream))))
            (take (- n 1) ((cdr stream)))))))

(take 1000 naturals_stream)
```