1995 Paper 6 Question 10

Foundations of Functional Programming

What does it mean to evaluate a λ-term to a value? Discuss, contrasting call-by-value, call-by-name and call-by-need. [5 marks]

Consider the ISWIM program

```
let suc2 n = suc (suc(n))
letrec df (n) = if iszero(n) then 0
                else suc2 (df (pre(n)))
in df(9)
```

What value does it return? [2 marks]

Translate the ISWIM program to the λ-calculus, taking as primitives *if*, Y and the basic arithmetic operation. [4 marks]

Show the first six steps of the SECD machine's execution for this λ-term. [9 marks]