TOC CS41001 Test 1

Time Limit : 1hr

24 September 2020

1. 5 marks

Prove that there exists x_0 in N such that for all y, $f_{x_0}(y) = y$ if y is a prime number , $f_{x+1}(y) + f_{x+2}(y)$ otherwise.

2. 3 + 2 marks

The function $add(a, b, c) = a + b + c$:

I Show that this is primitive recursive

II Write the lambda-calculus expression

3. 5 marks

The unrestricted grammar for $L' = \{ a^n b^n c^n : n \geq 1 \}$ can be given by the set of productions $S \rightarrow aBSc$, $S \rightarrow aBc$, $Ba \rightarrow aB$, $Bc \rightarrow bc$, $Bb \rightarrow bb$. Write down the complete description for an unrestricted grammar for $L = \{ a^n b^{2n} c^{3n} : n \geq 1 \}$.