Assignment 3

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1

L is context free Language and by definition of L_1, it contains all prefixes of language L.
I am going to show L_1 is also context free Language.
We know if L is context free then there exist a PDA for it. Let's call this PDA as M1.
Now we take another copy of same PDA and call it M2 and remove input sign from starting state of M2 means starting state will be only of M1.
In M2 we change the input symbol of all transitions to ϵ.
Now we add transition from state of M1 to corresponding state in M2 as ϵ,$\epsilon \rightarrow \epsilon$.
And only accepting state corresponding to M1 will be declared as accepting states in M2 and acceptance of M1 states will be removed.
This will be our whole PDA and start state will same remain as start state of M1.
Let whole PDA is called as M.
We know that M initially takes input in M1 and then after getting all string as input we move to M2 using epsilon transitions and there we check if we can reach final state of M2.
Hence all the Prefixes will be accepted by this PDA and this will generate all Prefix. Hence L_1 is context-free Language.

2

L is context free Language and by definition of L_1, it contains all suffix of language L.
I am going to show L_1 is also context free Language.
We know if L is context free then there exist a PDA for it Let's call this as M1.
Now we take another copy of same PDA and call it M2 and remove input sign of M1 means starting state will be only of M2.
There will be no accepting state in M2.
In M2 we change input symbol of all transitions to ϵ.
Now we add transition from state of M1 to corresponding state in M2 as ϵ,$\epsilon \rightarrow \epsilon$.

This will be our whole PDA and lets call it as M.
We can see firstly M2 will construct the stack appropriately using epsilon transitions and then we will move to M1 and starting taking input correspondingly and get string accepted.
Hence all suffix will be accepted by this PDA and this will generate all Suffix.
Hence L_1 is context-free