## National University of Computer and Emerging Sciences

## Theory of Automata(Section A,B,C,D,E)

## Fall2012: Mid 2

**16 November, 2012**

**Objective Questions:**

**Note: This part should be attempted and returned in first 15 min of exam.**

**Problem 1 [15 points] Time: 15 min**

[5\*2 marks]

**Part 1:** Determine whether each of the following statements is TRUE or FALSE. If TRUE then give a brief justification and if FALSE then give counter example.

1. Every subset of NCFL language is DCFL. True/ False

False

NCFL is also subset of itself.

1. If L1 is DCFL and L1 U L2 is NCFL, then L2 is always NCFL. True/ False

False

Let, L1 = Odd palindrome (DCFL), L2= Even Palindrome (DCFL), L1 U L2=> NCFL

1. If L1 are languages accepted by DPDA and L2 are languages accepted by NPDA, then L1 is a subset of L2. True/ False

True

NPDA’s are superset of DPDA’s as DPDA total paths will be part of total NPDA transitions.

1. DCFLs are not closed under complement. True/ False

True

Let L1 = a^n b^n c^m, L2= a^n b^m c^n and their intersection will be a^n b^n c^n which is non- CFL. That means its not closed under intersection. Property, L3 = L1 U L2 is closed. But taking complement on both sides, L3’ = L1’ intersection L2’. Not closed under intersection so not closed under complement too via above property.

1. For every context-free language L there exists an unambiguous grammar such that L = L(G). True/ False

False

Inherently ambiguous => a^n b^m c^m d^n U a^n b^n c^m d^m where n,m >0

[5 marks]

**Part2: [Only for Section A, B, C, D]**

Given a CFL over ∑ = {0, 1}, give an algorithm to determine if the language contains all strings containing at least 7 zeros in them.

For all w in total tree of CFL

1. Read w and run over this FA

0 0 0 0 0 0 0

[At input 1 this FA loops at the same state]

1. If w reaches final state accept otherwise reject.

[5 marks]

**Part2: [Only for Section E]**

1. Is the following language regular? Non-regular? CFL? Non-CFL? Give your reason in one line.

b)Is this grammar ambiguous? Justify?

S 🡪 aSbS | bSaS | NULL