

# Foundation of Computer Science (CS60001)

## Tutorial-03

August 21, 2010

1. Write Context Free Grammar for the following languages :

(a)  $L_1 =$  The set of all strings over the alphabet  $\{a, b\}$  with exactly twice as many a's as b's

(b)  $L_2 = \{a^n b^{2n} c^k \mid n, k \geq 1\}$

2. Design PDA for the following languages :

(a)  $L_1 = \{ a^m w c w^r b^m \mid w \in \{0, 1\}^+ \text{ and } m \geq 1 \}$ , where  $w$  is a non-empty string and  $w^r$  denotes the reversal of string  $w$ , that is,  $w$  is spelled backward to obtain  $w^r$

(b)  $L_2 = \{a^n b^m \mid m \leq n\}$