Institute Of Technology, Nirma University
B.Tech. (CSE) Sem VI
2CS601 Theory of Computation
Tutorial 7 (CFG Examples)

Q-1 Design CFG for the following languages, $\Sigma = \{0,1\}^*$

1. $L = \{0^n 1^{2n} \mid n >= 0\}$
2. String of even length.
3. Alternate sequence of 0 and 1.
4. $a^n\ b^n\ c^m \mid n, m >= 1$
5. $a^n\ b^n\ c^m \mid n, m >= 0$
6. $a^n\ b^n\ c^m\ d^m \mid n, m >= 0$

Q.2 Remove unit production from the following:

S → ABCD
A → a
B → C | b
C → D
D → c

Q.3 Remove null productions from the following.

1. S → ABC | AoA
   A → oA | BoC | ooo | B
   C → CA | AC
   D → ∧

2. S → AAA | B
   A → oA | B
   B → ∧

Q.4 Describe the language generated by the following CFGs:

S → aA | bC |b
A → aS | bB
B → aC | bA | a
C → aB | bS

Q.5 Convert the following grammar into CNF:

S → AACD
A → aAb | ∧
C → aC | a
D → aDa | bDb | ∧

Q.6 Remove unit productions from the following grammar and generate equivalent grammar:

S →ABCD|0
A→ BC|1
B→C
C→D
D→d