Exercise 5

Context-free Grammars & Languages

Q 1: Remove unit productions from the following grammars and generate equivalent grammar.

1. S -> ABC | 0, A -> 1, B -> C | 0, C -> D, D -> E, E -> 2
2. S -> ABCD | 0, A -> BC | 1, B -> C, C -> D, D -> d

Q 2: Convert the following CFGs to GNF:

1. S -> XY1 | 0 A -> 00X | 1 Y -> 1X1
2. S -> XY X -> YSY X -> YY | 1 Y -> 0X1 | 1
3. S -> Xa X -> aY Y -> Xa | b

Q 3: Identify the nonterminals from the following grammers, which fail to generate terminal

1. S - > XY1 | 0 X -> 00X Y -> 1X1 | 2
2. S -> XZ | 0 X -> YA | 1 Y -> Z1 | A2 | 3 Z -> 3Z

Q 4: Consider the following grammar:

S -> ASA | BSB | ASB | BSA | 1 A -> 0 B -> 1

Derive the strings 010, 111, 00101, 11100 using both left and right derivation

Q 5: Define Property

1. A CFL is accepted by a
   1. Pushdown Automata
   2. Finite Automata
   3. Turing Machine
   4. None of the above
2. A Pumping lemma is used for proving that
   1. A language is context free
   2. A language is not context free
   3. Two CFLs are the same
   4. Two CFLs are different
3. A CFG is a
   1. Type 0 Grammar
   2. Type 1 Grammar
   3. Type 2 Grammar
   4. Type 3 Grammar
4. The intersection of a CFL and regular language is a
   1. Regular language
   2. CFL
   3. Neither CFL nor regualr
   4. Cannoy say

Q 6:

1. Which of the following CFGs can also be recognized by a FSM?
2. S -> aS| Bs | aa | b
3. S -> aS | bS | a | b
4. S -> aS | bSb | a | b
5. All of the above
6. Let G be a CFG in GNF and L be the corresponding CFL. Let there be string z ϵ L. The number of productions used in deriving z is
   1. |z|
   2. 2|z|
   3. |z+1|
   4. |z|+1
7. Let L1={0n1n2m|n,m>=1} and L2={0m1n2n|n,m>=1}; given m>n, the intersection of L1 and L2 is the language
   1. L={0m1n2m|n,m>=1}
   2. L={0m1m2m|m>=1}
   3. L={0n1n2n|n>=1}
   4. None of the above