**National University of Computer & Emerging Sciences, Karachi  
Fall-2020 CS-Department  
Assignment 3**Fast

**Deadline 23 April 2020 11:55 pm**

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| **Course Code: CS301** | **Course Name: Theory of Automata** |

**Question 1:**

**Construct a CFG which generates the following languages:**

1. **L1 ={ anbn|n≥1} over alphabet {a,b}**
2. **L2 ={ anbman|n≥1} over alphabet {a,b}**
3. **L2 ={ 0n1m0m1n |m,n≥1} over alphabet {0,1}**
4. **L ={ a2n|n≥1} over alphabet {a}**
5. **L2 ={ 0n1n22n |n≥1} over alphabet {0,1,2}**
6. **L={0n1n2m3m m,n≥1} over alphabet {0,1,2,3}**
7. **L={0n1m22mm,n≥0} over alphabet {0,1,2}**
8. **L={0n12n2m m,n≥0} over alphabet {0,1,2}**
9. **L1 ={ anbm| n<= m+3}**
10. **L6 ={X|X belongs to (0+1)^+, X does not contain two consecutive zeros }**

**Question 2:**

**Construct a grammar which generates all even integers up to 998 over alphabet {0,1,2,3,4,5,6,7,8,9}**

**Question 3:**

**Construct grammar for an alternating sequences of 0’s and 1’s for example: 0101010 |10101010101…**

**Question 4:**

**Construct grammar for string which do not contain 3-consecutive b’s over alphabet {a,b}.**

**Question 5:**

**Construct grammar for string which contain at least one occurrence of ‘aaa’.**

**Question 6:**

**Define what one might mean by properly nested parenthesis structures involving two kinds of parentheses, say () and []. Intuitively, properly nested strings in this situation are ([]), ([[]])[()], but not ([)] or ((]]. Using your definition, give a context-free grammar for generating all properly nested parentheses.**

**Question 7:**

**Prove the grammar is ambiguous  
  
S →  aB | ab  
A →  aAB | a  
B →  ABb | b**

**Note : here you can suppose a string of your own wish ,but it belongs to language.**

**Question 8:**

**Prove the grammar is ambiguous**  **S →  a | aAb | abSb  
A →  aAAb | bS**

**Note : here you can suppose a string of your own wish ,but it belongs to language.**

**Question 9:**

**Obtain a grammar in Chomsky Normal Form (CNF) equivalent to the grammar G with productions P given  
  
S →  aAbB  
A →  aA| a  
B →  bB | b**

**Question 10: Convert given CFG to CNF**

**S ->ASA |aB**

**A -> B |S**

**B ->b |є**

**Question 11:**

**Show that, L ={ ap  | p is prime }Is not regular by using pumping lemma.**

**Question 12:**

**Show that, L ={ 0n1n2n  }Is not regular by using pumping lemma.**

**Question 13:**

**Show that, L ={ ww | w belongs to (a,b)\* }Is not regular by using pumping lemma.**

***BEST OF LUCK!***