B.tech. IV Sem (CSE), 2018-19

Theory of Computation, Assignment # 3
(Context-free languages and gramamrs)

1. Prove, whether the following are context-free languages?

    (a) $\{a^n b^n c^n \mid n \geq 1\}$

    (b) $\{a^n b^m \mid n \neq m, \text{ and } m,n \geq 0\}$

    (c) $\{a^m b^n \mid m \geq n\}$

2. Construct context-free grammars to accept the following language over $\{a,b\}$. Explain your grammar.

    (a) $\{w \mid w \text{ starts and ends with the same symbol}\}$

    (b) $\{w \mid |w| \text{ is odd}\}$

3. Given the context-free grammar G, describe the language and find out the strings set for language.

    $G = (V, \Sigma, S, P)$,

    $V = \{S, A\}$,

    $\Sigma = \{a, b\}$,

    $S = \{s \rightarrow AA, A \rightarrow AAA, A \rightarrow a, A \rightarrow bA, A \rightarrow Ab\}$.

4. Show that following CFGs are ambiguous.

    (a) $S \rightarrow abb \mid bb \mid Sa \mid a$

    (b) $S \rightarrow SaSaS \mid b$

    (c) $S \rightarrow aS \mid abb \mid A$

    (d) $A \rightarrow Aa \mid a$

5. Show that the following grammar generates only the language $\{a^m b^n \mid m \neq n \text{ and } m,n \geq 0\}$

    $S \rightarrow AE \mid EB$

    $E \rightarrow aEb \mid \varepsilon$

    $A \rightarrow aA \mid a$

    $B \rightarrow bB \mid b$

6. Using pumping Lemma for CFL show that the language $L = \{a^n b^n c^n \mid n \geq 0\}$ is not context-free.

    Submission deadline: March 28, 2019. Your answers must be hand written on A4 paper (only), then scan and submit through ERP, in pdf format only. Where answers are copied verbatim, 50% marks will be deducted for both the parties.