B TECH
(SEM VII) THEORY EXAMINATION 2018-19
THEORY OF AUTOMATA AND FORMAL LANGUEGES

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   2 x 10 = 20

   a.   Define finite automata.
   b.   Write the regular expression for the language: $L= \{a^m b^m (n+m)$ is even$\}$.
   c.   Design a Turing Machine which accepts the string over $\{0,1\}$ containing even number of 1's
   d.   Draw a derivation Tree for the string **abaaba.** Choose productions accordingly.
   e.   Define Pushdown Automata.
   f.   Check out the string **abbcbba** will be accepted by PDA for (wcw^R) or not.
   g.   What is regular expression?
   h.   Explain Deterministic PDA?
   i.   What do you mean by DFA?
   j.   Prove that recursively enumerable languages are closed under intersection.

SECTION B

2.   **Attempt any *three* of the following:**   10 x 3 = 30

   a.   Construct a DFA equivalent to the language that contains the string with 011 as substring..
   b.   State and prove My-hill Nerode Theorem.
   c.   Does the PCP with two lists x= (1,10,10111) and y= (111,0,10) have a PCP solution?
   d.   Construct a CFG for language containing at least one occurrence of double **a.**
   e.   Construct a PDA for the language $L= \{a^p b^q c^m \ |p+m=q\}$

SECTION C

3.   **Attempt any *one* part of the following:**   10 x 1 = 10

   (a)   Using Pumping Lemma for context free Language; prove that the following language is not context free

$$L=\{a^p| \text{ P is a prime number}\}$$

   (b)   Construct a grammar generating L={wcwT |w belongs to{a,b}*}

4.   **Attempt any *one* part of the following:**   10 x 1 = 10

   (a)   Convert the Given CFG into GNF where V={S,X}, T={0,1} and P is given by :S →XX|0 ,X→SS|1
   (b)   Find the Chomsky Normal form equivalent to S→aAbB, A→aA|a, B→bB|b

5.   **Attempt any *one* part of the following:**   10 x 1 = 10

   (a)   Convert the following Grammar to PDA that accepts the language: S→ 0S1 | ^ , A→ bS | aS | a

   (b)   Show that CFG G with production S→SS|(S)|^ is ambiguous.

6. **Attempt any *one* part of the following:** **10 x 1 = 10**

    (a)   Construct a Turing Machine for reversing a given string

    (b)   Design a Turing machine to multiply two positive integers.

7. **Attempt any *one* part of the following:** **10 x 1 = 10**

    (a)   Construct a DFA accepting all strings over {a,b} such that the number of 1's in w is 3 mod 4.

    (b)   Construct a mealy machine for regular expression (0+1)*(00+11).