Total No. of Pages: 2

Roll No: 2016UIT2563.

Fifth Semester

BE (IT)

END Semester Examination, November-2018

ITC16: Theory of Computation

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt **any five** Questions. Assume Suitable-missing data, if any.

Q1: (a) Construct a DFA with minimum states that accepts the language L = {w: (n_a(w) – n_b(w)) mod 3 =0} and ∑={a,b}. (4)

(b) Construct a DFA that accepts the language of all legal Infix arithmetic expressions over the alphabet ∑ = {a,b,+,-,*,/}, assuming normal precedence rules apply. (4)

(c) Find L1 / L2 for L1= L(a*baa*) and L2= L(ab*). (2)

Q2: (a) Let L1= {$a^{n+3}b^n$ | n ≥ 2} and L2= {a^nb^{n-2} | n ≥ 3} are two languages defined over ∑={a,b}. Find the Grammar that generates L1L2 and L1 U L2. (5)

(b)Find an NFA with three states that accepts the language L= {a^n: n ≥ 1} U {b^ma^k: m ≥ 0, k ≥ 0}. Do you think the language can be accepted by an NFA with fewer than three states? (5)

Q3: (a) State and prove the Pumping Lemma theorem for Context-Free Languages (5)

(b) Construct a Moore Machine that will add two Binary numbers. The inputs to machine will be pair of bits and numbers are added from right to left. (5)

Q4: (a) Convert the following regular grammar into Finite automata (3)

S→ aA|bS, A→ bB| a, B→aS| b

(b) Write the Regular expression for the language L= {w: n_a (w) mod 5 >0} and ∑={a,b}. (4)

(c) Find the Regular expression for the language generated by the following grammar. (3)

S→ aS | Sb | bSa | ϵ

Q5: (a) Convert the grammar S→ aAB|bBA, A→ bS|a, B→ aS|b to a Push down automata. **(4)**

(b) Design a Push down Automata that accepts the language L= $\{a^i b^j c^k d^l \mid i=k \text{ or } j=l\}$. **(6)**

Q6: (a) What is the use and significance of Normal forms. Reduce the following CFG into Chomsky normal form

S→ ASB, A→aAS|a| ϵ, B→SbS| A | bb **(5)**

(b) Find the reduced grammar equivalent to the grammar S→ aAa, A→ bBB, B→ab, C→aB. **(3)**

(c) Show that the grammar S→ aB| ab, A→ aAB| a, B→ABb| b is ambiguous. **(2)**

Q7: Design a Turing Machine that **(5*2=10)**

(a) Accepts the language L= $a^n b^n c^n \mid n \geq 1$.

(b) Accepts the language L= $\{WW^R$, where $W \epsilon \{a,b\}^+$. Also show the Instantaneous Description for the string 'abaaaaba'.

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baba