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**Question Paper Code: 55804**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Computer Science and Engineering

15UCS504- THEORY OF COMPUTATION

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Epsilon transition is present is \_\_\_\_\_ . CO1- R  
(a) DFA                      (b) NFA                      (c) Both                      (d) None
2. Which of the following is NOT the set of regular expression CO2- U  
 $R = (ab + abb)^* bbab$   
(a) ababbbbab                      (b) abbbab                      (c) ababbabbbbab                      (d) abababab
3. How many types of parse tree available? CO3-U  
(a) 2                      (b) 3                      (c) 4                      (d) 1
4. Which of the following pairs have DIFFERENT expressive power? CO4- R  
(a) Deterministic finite automata(DFA) and Non-deterministic finite automata(NFA)  
(b) Deterministic push down automata (DPDA) and Non-deterministic push down automata (NPDA)  
(c) Deterministic single-tape Turing machine and Non-deterministic single-tape Turing machine  
(d) Single-tape Turing machine and multi-tape Turing machine
5. How many tuples are present in Turing machine CO5- R  
(a) 4                      (b) 5                      (c) 6                      (d) 7

PART – B (5 x 3= 15Marks)

6. Define NFA with epsilon transition and give example CO1- U
7. Compare the differences between DFA and NFA CO2- U

8. What is (a) Derivation (b) Derivation/parse tree (c) Subtree CO3- U
9. List the languages accepted by PDA and define them CO4- R
10. Define Recursive and recursive enumerable language. CO5- R

PART – C (5 x 16= 80 Marks)

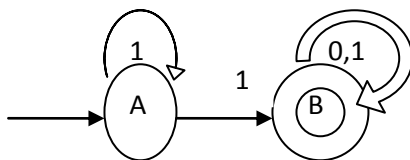
11. (a) If L is accepted by an NFA with  $\epsilon$ -transition then show that L is accepted by an NFA without  $\epsilon$ -transition. CO1- U (16)

Or

- (b) Consider the following  $\epsilon$ -NFA. Compute the  $\epsilon$ -Closure of each state and find its equivalent DFA CO1- App (16)

	$\epsilon$	0	1
$\rightarrow p$	-	{p}	{q}
q	{p}	{q}	{r}
*r	{q}	{r}	-

12. (a) Solve the regular expression for the following DFA, by finding  $R_{ij}^{(k)}$  CO2- App (16)



Or

- (b) Construct min-state DFA for the regular expression  $(a/b)^*abb$ . CO2- App (16)

13. (a) Consider the following productions: CO3-U (16)

$S \rightarrow aB \mid bA$   
 $A \rightarrow aS \mid bAA \mid a$   
 $B \rightarrow bS \mid aBB \mid b$

For the string  $aaabbabbba$  &  $baaabbabba$ , find a leftmost derivation, a rightmost derivation and draw the derivation tree.

Or

- (b) Convert the following Context Free Grammar to Chomsky Normal Form? CO3-App (16)

$S \rightarrow ASB$   
 $A \rightarrow aAS \mid a \mid \epsilon$   
 $B \rightarrow SbS \mid A \mid bb$

14. (a) Construct PDA for  $L = \{ a^n b^m c^m d^n \mid m, n \geq 1 \}$  by empty stack. CO4-App (16)  
 Or  
 (b) Show the equivalence of PDA by empty stack and PDA by final state. CO4-U (16)
15. (a) Construct the TMM to implement the function multiplication using subroutine copy CO5-App (16)  
 Or  
 (b) Find the languages obtained from the following operations and prove the theorem CO5-App (16)
1. Union of two recursive languages is -----
  2. Union of two recursive enumerable languages is -----
  3. L if L and complement of L are recursive enumerable then L is ----  
 -----
  4. Complement of recursive language is -----

