C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 55204

B.E./B.Tech. DEGREE EXAMINATION, MAY 2018

Fifth Semester

Computer Science and Engineering

15UCS504 THEORY OF COMPUTATION

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer All Questions

PART A - (5x 1 = 5 Marks)

1. Given an arbitrary non-deterministic finite automaton (NFA) with N states, the maximum number of states in an equivalent DFA. CO1- R

   (a) N^2 (b) 2^N (c) 2N (d) N!

2. A language is represented by a regular expression (a)*(a + ba). Which of the following string does not belong to the regular set represented by the above expression? CO2- U

   (a) aaa (b) aba (c) ababa (d) aa

3. Which of the following strings is not generated by the following grammar? $S \rightarrow SaSbS|\varepsilon$ CO3- R

   (a) aabb (b) abab (c) aababb (d) aaabb

4. Consider a language L for which there exists a Turing machine T, that accepts every word in L and either rejects or loops for every word that is not in L. The language L is CO4- R

   (a) NP Hard (b) NP Complete (c) recursive (d) recursively enumerable

5. A Turing Machine represented ba a transition table has entry 1Lq4 corresponding to q3-row and 0-column then which of the following statement is false — CO5- R

(a) the symbol under read/write head is 0 (b) next state is q4

(c) q3 is the initial state (d) all of the above

PART – B (5 x 3= 15Marks)

6. Design a DFA that accepts the language over the alphabet {0, 1} and that has the set of all strings with 011 as a substring. — CO1- U

7. State the pumping lemma for Regular languages. — CO2- U

8. For the grammar S->aCa, C->aCa/b. Find L(G). — CO3- U

9. Show that, for arbitrary context free grammar G1 and G2, the problem "L (G1) ∩ L (G2) is Context free "is undecidable. — CO4- U

10. Design a Turing Machine that can accept the language denoted by regular expression 11*. — CO5- U

PART – C (5 x 16= 80Marks)

11. (a) Consider the following ε-NFA. Compute the ε-Closure of each state and find its equivalent DFA. — CO1-Ana (16)

State/Inputs	ε	a	b	c
➔ P	q	p	Φ	Φ
q	r	Φ	p	Φ
*r	Φ	Φ	Φ	r

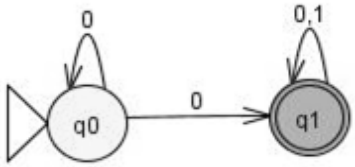
Or

(b) Give the state diagram of a DFA (or an NFA) that accepts only binary strings which represent numbers divisible by two or three. E.g., it accepts 0, 00, 10, 011, but it rejects the empty string, 1, 101, 0111. — CO1 -Ana (16)

12. (a) Construct a minimized DFA for the regular expression $(a|b)^*abb$. CO2 -U (16)

Or

(b) Find the regular expression corresponding to the equivalent finite automaton given below using equation method $R_{ij}^{(k)}$ CO2 -U (16)



13. (a) Begin with the grammar S->0A0|1B1|BB; A->C; B->S|A; C->S|ε and simplify using the safe order CO3- App (16)
(i)Eliminate ε-Productions
(ii)Eliminate unit productions
(iii)Eliminate useless symbols
(iv)Put the resultant grammar in Chomsky Normal Form?

Or

(b) Construct the grammar for the following PDA. CO3- App (16)
M = ({q0,q1}, {0, 1}, {X, z0}, δ, q0, Z0, Φ) and where δ is given by

$\delta(q_0,0,Z_0)=\{(q_0,XZ_0)\}$, $\delta(q_0,0,X)=\{(q_0,XX)\}$,
$\delta(q_0,1,X)=\{(q_1,\varepsilon)\}$, $\delta(q_1,1,X)=\{(q_1,\varepsilon)\}$,
$\delta(q_1,\varepsilon, X)=\{(q_1,\varepsilon)\}$, $\delta(q_1,\varepsilon,Z_0)=\{(q_1,\varepsilon)\}$

14. (a) Explain how the multiple tracks in a Turing Machine can be used for testing given positive integer is a prime or not. CO4-Ana (16)

Or

(b) Construct a Turing Machine that accepts the language $L= \{0^n1^n2^n| n>=1\}$ using checking off symbols technique. CO4 -App (16)

15. (a) Define Computational Complexity? Explain whether the class of Problems that can be solved in polynomial time is equivalent to the class of non-deterministic polynomial problems i.e whether P=NP? CO5- U (16)

Or

(b) State and prove post's correspondence problem. CO5- U (16)

55204