Reg. No. : | | | | | | | | | | |

Question Paper Code: 55024

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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

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

2. Let L = $\{0^n \mid n \text{ is a perfect square}\}$. Then language L is

   (a) Context free (b) Regular (c) Not Regular (d) Recursive

3. The language generated by the grammar S -> aSa|bSb|a|b over the alphabet {a, b} is the set of

   (a) All palindrome
   (b) All odd length palindromes
   (c) All even length palindromes
   (d) Strings that begin and end with ‘a’ or ‘b’

4. Context free languages are not closed under which of the following operation.

   (a) Union
   (b) Intersection
   (c) Concatenation
   (d) Closure

5. If L and L’ are recursively enumerable, then L is

   (a) Context free
   (b) Regular
   (c) Context sensitive
   (d) Recursive

PART - B (5 x 3 = 15 Marks)

6. Design a DFA to accept the language L = { w | w has both an even number of 0's and even number of 1's}?

7. State the pumping lemma for regular language.

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

9. Define the acceptance of PDA by empty stack. Is it true that the language accepted by a PDA by empty stack is equivalent to the language accepted by a PDA by final state.

10. State the closure properties of recursive and recursively enumerable languages.

PART - C (5 x 16 = 80 Marks)

11. (a) (i) Compare DFA and NFA with examples. (6)

(ii) Construct DFA equivalent to the NFA given below (10)

	0	1
p	{p,q}	{p}
q	{r}	{r}
r	{s}	ϕ
*s	{s}	{s}

Or

(b) (i) Construct the deterministic finite automata to accept string of 0's and 1's ending with the string 011. (8)

(ii) Prove that a language accepted by some NFA if and only if L is accepted by DFA. (8)

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

Or

(b) (i) Prove that the language $L=\{0^n1^n \mid n>=1\}$ is not regular. (8)

(ii) Explain any three closure properties of Regular languages. (8)

13. (a) (i) Let G be a grammar S->0B|1A, A->0|0S|1AA, B->1|1S|0BB. For the string 00110101 find its leftmost derivation and derivation tree. (8)

(ii) Prove that the following grammar is ambiguous. S -> aS | aSbS | ε. (8)

Or

(b) Define Chomsky Normal Form (CNF).Covert the following grammar to CNF.
S -> AB | aB
B -> aab | ε
B-> bbA (16)

14. (a) (i) Construct a PDA accepting by empty stack for the language $L=\{a^m b^m c^n \mid m, n>=1\}$. (8)

(ii) If P be a PDA. Then there is a context free grammar G such that L(G)=L(P). (8)

Or

(b) (i) Find the PDA equivalent to the given CFG with the following productions
S -> aB | bA, A -> a | aS | bAA, B -> b | bS | aBB. (8)

(ii) State and prove the pumping lemma for context free language. (8)

15. (a) (i) Explain the programming techniques for Turing machine. (8)

(ii) Prove the following theorem 'If both a language L and its complement are RE, then L is recursive'. (8)

Or

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