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

Question Paper Code: 45204A

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

Fifth Semester

Computer Science and Engineering

14UCS504 – THEORY OF COMPUTATION

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A language L is accepted by the Finite Automata if and only if it is

   (a) Context-free (b) context-sensitive (c) recursive (d) right-linear

2. What is the minimum number of states in a DFA that recognizes the set of all binary strings which contains four consecutive 1's?

   (a) 6 (b) 5 (c) 4 (d) 3

3. The string 1101 does not belong to the set represented by

   (a) 110*(0+1) (b) 1(0+1)*101
   (c) (10)*(01)*(00+11) (d) ((11)*+01)*

4. The finite automata accept which of the following language.

   (a) context free language (b) regular language
   (c) context sensitive language (d) all the above

5. How many tuples are needed to represent an instantaneous description of a PDA?

   (a) 1 (b) 2 (c) 3 (d) 4

6. The language $L = \{0^m 1^m / m \geq 1\}$ is a

(a) regular language (b) context free language
(c) both (a) and (b) (d) none of these

7. While converting the context free grammar into Greibach normal form, which of the following is not necessary?

(a) elimination of null production
(b) elimination of unit production
(c) converting given grammar in Chomsky normal from
(d) none of these

8. A PDM behaves like a TM when the number of auxiliary memory it has, is

(a) 0 (b) 1 or more (c) 2 or more (d) all the above

9. Recursively enumerable languages are not closed under

(a) Union (b) intersection
(c) complementation (d) concatenation

10. The diagonalization language L_d is

(a) recursive (b) not recursively enumerable
(c) recursively enumerable (d) both (a) and (c)

PART - B (5 x 2 = 10 Marks)

11. Differentiate DFA and NFA.

12. When two states are equivalent and distinguishable.

13. Let G = (N,T,P,S), P = { S →A1B / a, A → 0A / ε, B →0B / 1B / ε} give rightmost and leftmost derivation for 00101.

14. Design a turing machine for computing the function $f(x) = x + 1$.

15. Give some examples of NP-complete problems

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Explain the different forms of proofs with examples. (8)

(ii) Prove that for every integer n≥0 the number $4^{2n+1} + 3^{n+2}$ is multiple of 13. (8)

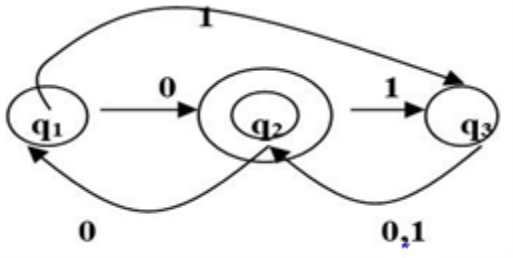
Or

(b) (i) Consider the following Ɛ-NFA. Compute Ɛ-closure of each state and find its equivalent DFA. (10)

δ	Ɛ	a	b	c
→	ϕ	{p	{q	{r}
q	{p	{q	{r}	ϕ
*r	{q	{r}	ϕ	{p

(ii) Design a DFA which accepts odd number of 1's and any number 0's. (6)

17. (a) Obtain the regular expression that denotes the language accepted by, using the recursive relation. (16)



Or

(b) (i) Construct deterministic finite automata for the regular expression $(a + b)^* ab$. (8)

(ii) State and prove any two closure properties of regular language. (8)

18. (a) (i) Let $S \rightarrow aB/bA$, $A \rightarrow aS/bAA/a$, $B \rightarrow bS/aBB/b$. Show that $S \Rightarrow aaabbabbba$ and construct a derivation tree whose yield is in *"aaabbabbba"*. (8)

(ii) Construct a PDA for the language $L = \left\{ \frac{a^n \; b^{2n}}{n \geq 1} \right\}$. (8)

Or

(b) (i) Construct a PDA for set of palindrome over the alphabet {a, b}. $L(M) = \{WcW^R\}$. (8)

(ii) Show that the following grammars are ambiguous. (8)

19. (a) (i) Discuss the closure properties of CFL and prove any one of the property. (8)

(ii) Explain the programming techniques of turing machine. (8)

Or

(b) (i) Design a turing machine which recognizes palindrome over alphabet {0, 1}. (6)

(ii) Design a turing machine to compute $f(m,n) = m*n, \forall\ m,\ n \in N$. (10)

20. (a) (i) State post correspondence problem. Let $\sum = \{a, b\}^*$. Let A and B be lists of three strings as given below

$A = \{b, bab^3, ba\}$ $B = \{b^3, ba, a\}$. Does this instance of PCP have a solution? (6)

(ii) Prove that for two recursive language L_1 and L_2, their union and intersection is recursive. (10)

Or

(b) Define PCP and MPCP. Consider the Turing Machine M and w=01, where M=({q1 q2,q3},{0,1} {0,1,B}, δ,q1,B,{q3}) and δ is given by.

qi	δ(qi,0)	δ(qi,1)	δ(qi,B)
q1	(q2,1,R)	(q2,0,L)	(q2,1,L)
q2	(q3,0,L)	(q1,0,R)	(q2,0,R)
q3	--	--	--

Reduce the above problem to post's correspondence problem and find that PCP has a solution or not. (16)