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

Question Paper Code: 41254

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

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. Any NFA can be converted to a DFA

   (a) always (b) never
   (c) depending on the NFA (d) depending on the language of NFA

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. Pumping lemma is generally used for proving

   (a) A given grammar is regular
   (b) A given grammar is not regular
   (c) Whether two given regular expressions are equivalent or not
   (d) None of these

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 $\{a^m b^n c^{m+n} \mid m, n \geq 1\}$ is

(a) regular language
(b) context free language
(c) content sensitive but not context free
(d) type-0 but not context sensitive

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. What is the maximum number of codes is generated to encode a turing machine which consists of four transition function?

(a) 12 (b) 24 (c) 36 (d) 48

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. Define the language generated by a PDA.

14. Define a turing machine.

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 $n \geq 0$ the number $4^{2n+1} + 3^{n+2}$ is multiple of 13. (8)

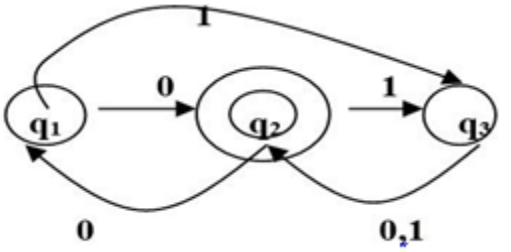
Or

(b) (i) Prove that if *L* is accepted by an NFA with ε transitions, then *L* is also accepted by an NFA without *ε* transitions. (8)

(ii) Consider the following Ɛ-NFA. Compute Ɛ-closure of each state and find its equivalent DFA (8)

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

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) Prove that Lu is RE but not recursive. (8)

(ii) Obtain the code for the TM M=({q1 q2, q3},{0, 1} {0, 1, B}, δ, q1, B, {q2}) With the moves δ(q1, 1)=(q3, 0, R), δ(q3, 0)=(q1, 1, R), δ(q3, 1)=(q2, 0, R), δ(q3, B)=(q3, 1, L). (8)

Or

(b) (i) Define universal language L_u. Prove that L_u is recursively enumerable. (8)

(ii) State halting problem. Show that it is un-decidable. (8)