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

Question Paper Code: 55204

B.E./B.Tech. DEGREE EXAMINATION, NOV 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. Number of states required to accept string ending with 10. CO1- U

   (a) 3 (b) 2 (c) 1 (d) Can't be represented

2. Which of the following does not represents the given language? CO2- U
   Language: {0,01}

   (a) 0+01 (b) {0} U {01} (c) {0} U {0}{1} (d) {0} ^ {01}

3. If L1 and L2 are context free languages, L1-L2 are context free: CO3- R

   (a) Always (b) Sometimes (c) Never (d) None of the above

4. A push down automata is said to be _____ if it has at most one transition around all configurations. CO4- R

   (a) Finite (b) Non regular (c) Non-deterministic (d) Deterministic

5. A Language L may not be accepted by a Turing Machine if : CO5- R

   (a) It is recursively enumerable (b) It is recursive

   (c) L can be enumerated by some turing machine (d) None of the above

PART – B (5 x 3= 15 Marks)

6. How a Non deterministic finite state automata (NFA) differs from a Deterministic finite state automata (DFA). CO1- R

7. Define Pumping lemma for regular language. CO2- R

8. Define a derivation tree for a context-free grammar. CO3- R

9. What are the closure properties of context-free language? CO4- R

10. Define the language of Turing Machine. CO5- R

PART – C (5 x 16= 80Marks)

11. (a) Convert the following NFA to it's equivalent DFA. CO1- App (16)

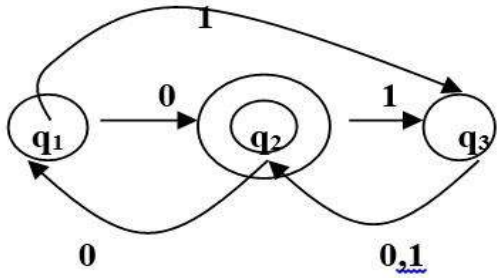
	0	1
q0	{q0,q1}	{q0 }
q1	q2	q1
q2	q3	q3
*q3	ϕ	q2

Or

(b) Compute (i) ϵ-closure (ii) Convert the automaton to a DFA CO1- App (16)

δ	ϵ	a	b	c
p	{ϕ}	{p}	{q}	{r}
q	{p}	{q}	{r}	{ϕ}
r	{q}	{r}	{ϕ}	{p}

12. (a) Construct Regular Expression for the following DFA. CO2- App (16)



Or

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

13. (a) (i) Show that the grammar S->a | abSb | aAb, ,A->bS | aAAb is ambiguous. CO3- App (6)

(ii) Consider the following productions: CO3- App (10)

S ->aB | bA

A->aS | bAA | a

B->bS | aBB | b.

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

Or

(b) (i) Find a grammar in Chomsky normal form equivalent to form. CO3- App (8)

S->AB/aB
A->aab/ϵ
B->bbA

(ii) Construct a grammar in GNF which is equivalent to the grammar CO3- App (8)

S->AA/a
A->SS/b

14. (a) (i) Construct a PDA accepting by empty stack the languages $\{a^m b^m c^n / m,n \geq 1\}$ CO4- App (8)

(ii) Show that if a language L is accepted by a PDA then there exists a CFG generating L. CO4- U (8)

Or

(b) (i) Let L be $L(P_F)$ for some PDA $PF = (Q,\Sigma,\Gamma,\delta_F,q_0,Z_0,F)$. Then there is a PDA P_N such that $L = N(P_N)$ [From final state to empty stack] CO4- U (8)

(ii) Construct a context-free grammar G which accepts N (M), where M = ({q0,q1}, {a,b}, {z0,z1}, δ, q0, z0, ϕ) and where δ is given by CO4-App (8)

δ(q0, b, z0) = { (q0,zz0)}
δ(q0, ε, z0) = { (q0, ε)}
δ(q0, b, z) = { (q0, zz)}
δ(q0, a, z) = { (q1, z)}
δ(q1, b, z) = { (q1, ε)}
δ(q1, a, z0) = { (q0, z0)}

15. (a) (i) Construct a TM for the language $L=\{a^n b^n c^n / n \geq 0\}$. CO5- U (8)

(ii) Explain Multitape TM and Non deterministic TM CO5- U (8)

Or

(b) (i) Construct a Turing machine to compute multiplication with subroutine "copy" CO5- U (10)

(ii) Show that for two recursive language L1 and L2 each of the following is recursive CO5- U (6)

1. L1U L2
2. L1$\cap$ L2
3. L1'

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