C

Reg. No. :

Question Paper Code: 55204

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022
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   CO1- R
   Deterministic finite state automata (DFA).

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)

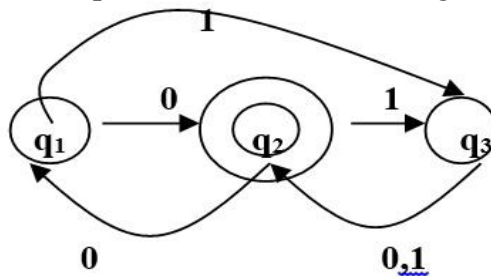11. (a) Convert the following NFA to it's equivalent DFA. CO1- App (16)

	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

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

$S \to AB/aB$

$A \to aab/\epsilon$

$B \to bbA$

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

$S \to AA/a$

$A \to SS/b$

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)

$\delta(q0, b, z0) = \{ (q0,zz0)\}$

$\delta(q0, \varepsilon, z0) = \{ (q0, \varepsilon)\}$

$\delta(q0, b, z) = \{ (q0, zz)\}$

$\delta(q0, a, z) = \{ (q1, z)\}$

$\delta(q1, b, z) = \{ (q1, \varepsilon)\}$

$\delta(q1, a, z0) = \{ (q0, z0)\}$

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∩ L2

3. L1'

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