Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–II • EXAMINATION – SUMMER 2013

Subject Code: 620007 Date: 10-06-2013

Subject Name: Theory Of Computation

Time: 10.30 am - 01.00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define One-to-One & Onto function with example. **04**

(b) In each case, a relation on the set {1,2,3} is given. Of the three properties, reflexivity, Symmetry and Transitivity which ones the relation has. Give reasons. **04**

i. R= {(1,3),(3,1),(2,2)}

ii. R={(1,1),(2,2),(3,3),(1,2)}

(c) Let P(n) be the statement : 1+2+3+……..+n =n (n+1)/2 **03**
Show that P (n) is true for every n>=0 by principle of mathematical induction.

(d) Find the regular expression for the following: **03**

i. Strings with next-to-last-symbol 0

ii. Strings containing 110

iii. Strings containing at least two 0's

Q.2 **(a)** Define Regular Language and Regular Expression over ∑ **03**

(b) Construct a Finite Automata for: (0+1)* (01+110) **04**

(c) a. Define: **03**

i. Finite Automaton

ii. Strong Principle of Mathematical Induction

b. Construct the Finite Automata for: (11+110)*0 **04**

OR

(c) Given that L1 = {x ϵ (0,1)* | x ends with 01} **07**
L2 = {x ϵ (0,1)* | x ends with 11}
Give FA for L1, L2 and L1 U L2.

Q.3 **(a)** Find minimal FA for following FA. **07**
Q={1,2,3,4,5,6} A= {2,5} and q0 =1

State	input – a	input -b
1	2	1
2	4	1
3	2	5
4	6	3
5	4	5
6	5	2

(b) Define: NFA-^ & Pumping Lemma for Regular Languages **07**

OR

Q.3 **(a)** Find the CFG corresponding to the regular expression **07**
(011+1)*(01)*

(b) What is an Ambiguous grammar? Explain this concept with "Dangling Else" problem. **07**

Q.4 **(a)** Let M = (Q, Σ, q0 , б, A) where Q= {A,B,C,D,E}, q0 = A and A={E} and transition is given as follows. **07**

State (q)	δ(q,∧)	δ(q,0)	δ(q,1)
A	{B,D}	{A}	ϕ
B	ϕ	{C}	{E}
C	ϕ	ϕ	{B}
D	ϕ	{E}	{D}
E	ϕ	ϕ	ϕ

Give the transition diagram for above NFA-∧ & also construct the NFA for the same.

(b) Construct a DPDA accepting balanced strings of Brackets. **07**

OR

Q.4 **(a)** A transition table is given for an NFA-∧ : **05**

State (q)	δ(q,a)	δ(q,b)	δ(q,∧)
1	ϕ	ϕ	{2}
2	{3}	ϕ	{5}
3	ϕ	{4}	ϕ
4	{4}	ϕ	{1}
5	ϕ	{6,7}	ϕ
6	{5}	ϕ	ϕ
7	ϕ	ϕ	{1}

Find:

i. ∧({1})

ii. δ* (1,ab)

Q.4 **(b)** Write a short note on recursive enumerable and recursive language. **05**

(c) Define: **04**

i. Turing Machine

ii. Push Down Automata

Q.5 **(a)** Construct a Turing Machine accepting Palindrome strings over a & b **07**

(b) Convert the CFG with following productions into CNF: **07**

S→ABA A→aA |∧ B→bB |∧

OR

Q.5 **(a)** Construct a DPDA to accept the language of strings with more a's than b's given by L={ x ϵ {*a, b*}* | na(x) > nb(x) } **05**

(b) Show that if L1 & L2 are context-free languages then the languages L1UL2, L1L2 and L1* are also CFLs. **05**

(c) Using pumping lemma check whether the language is regular or not. L={0^i 1^i | i>=0)} **04**

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