Seat No.: _____ Enrolment No.______

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Sem-II Examination July 2010

Subject code: 620007
Subject Name: Theory of Computation

Date: 09 / 07 /2010 **Time: 11.00 am – 01.30 pm**
Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4.

Q.1 **(a)** Define surjection , injection and bijection. **05**

(b) Explain : p→ q and p➔q. **05**

(c) Find regular expression for **04**

(i) Only two 0 and 1 in any order.
(ii) String doesn't end with 11.

Q.2 **(a)** Give recursive definition for **04**
Set of all strings in {0,1}* containing substring 00 .

(b) Prove that if either of a and b is even number the a*b is even number. **03**

(c) Draw FA to recognize the following languages defined over {0,1}*. **07**

(i) (0+1)*(110)
(ii) Language containing string of exactly two zeros.

OR

(c) Find languages corresponding to following CFG production. **07**

(i) S → aSa | bSb | ^
(ii) S → aS | bS | a
(iii) S → aSb | bSa | ^

Q.3 **(a)** 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.

(b) Define NFA and б* for NFA . **07**

OR

Q.3 **(a)** Find minimal FA for following FA. **07**

Q={1,2,3,4,5,6} A= {3,6} and q0 =1

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

(b) Explain NFA - ^ . What are different kind of non-determinism possible in NFA - ^ ? Also define ^ closure. **07**

Q.4 **(a)** Let M = (Q, ∑, q0 , б, A) where Q= {a,b,c,d}, q0 = a and A={d} and б is given as follows. **07**

State	input – 0	input -1
a	{b,d}	{c,d}
b	{b}	{d}
c	{d}	{c}
d	Φ	Φ

Give transition diagram for above NFA & find whether string 100101 will be accepted by it or not.

(b) Give transition table for deterministic PDA recognizing following languages. **07**

{x є (a,b)* | Na(x) > Nb(x)}

OR

Q.4 **(a)** Let NFA - ^ machine M= (Q, ∑, q0 , б, A) where Q= {a,b,c,d} and A={d} and б is given as follows. **07**

State	input – 0	input -1	^
a	{d}	{c,d}	{b}
b	{b}	{d}	{c}
c	{d}	{c}	{a}
d	Φ	Φ	Φ

Find equivalent NFA and FA for above NFA - ^.

(b) Draw Turing machine to accept palindromes over {a , b}. **07**

Q.5 **(a)** Consider CFG with production **05**

S→ S+S | S-S | S*S | S/S | (S) |a

Draw derivation trees corresponding to two different left most derivation of

a + (a * a) / a – a.

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

(c) Construct Turing machine to reverse a string. **04**

OR

Q.5 **(a)** Convert following grammar into Chomsky normal form. **05**

S → AACD

A→ aAb | ^

C → aC | a

D → aDa | bDb | ^

(b) Define & describe PDA. **05**

(c) Draw NFA - ^ corresponding to following regular expression over ∑ = {0,1}. **04**

010* + 0(01+10)*11

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